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Better Outdoor Aerials—Page 649

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UNIV.

POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

REG. U. S. PAT.

SEE PAGE 534

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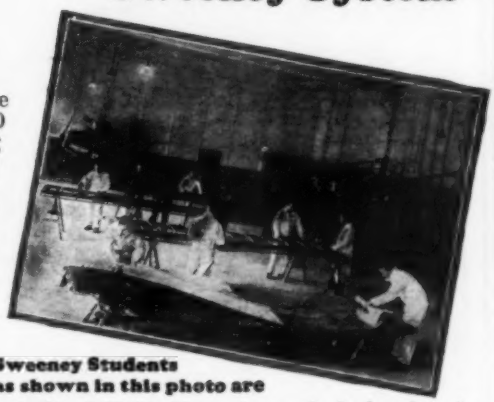

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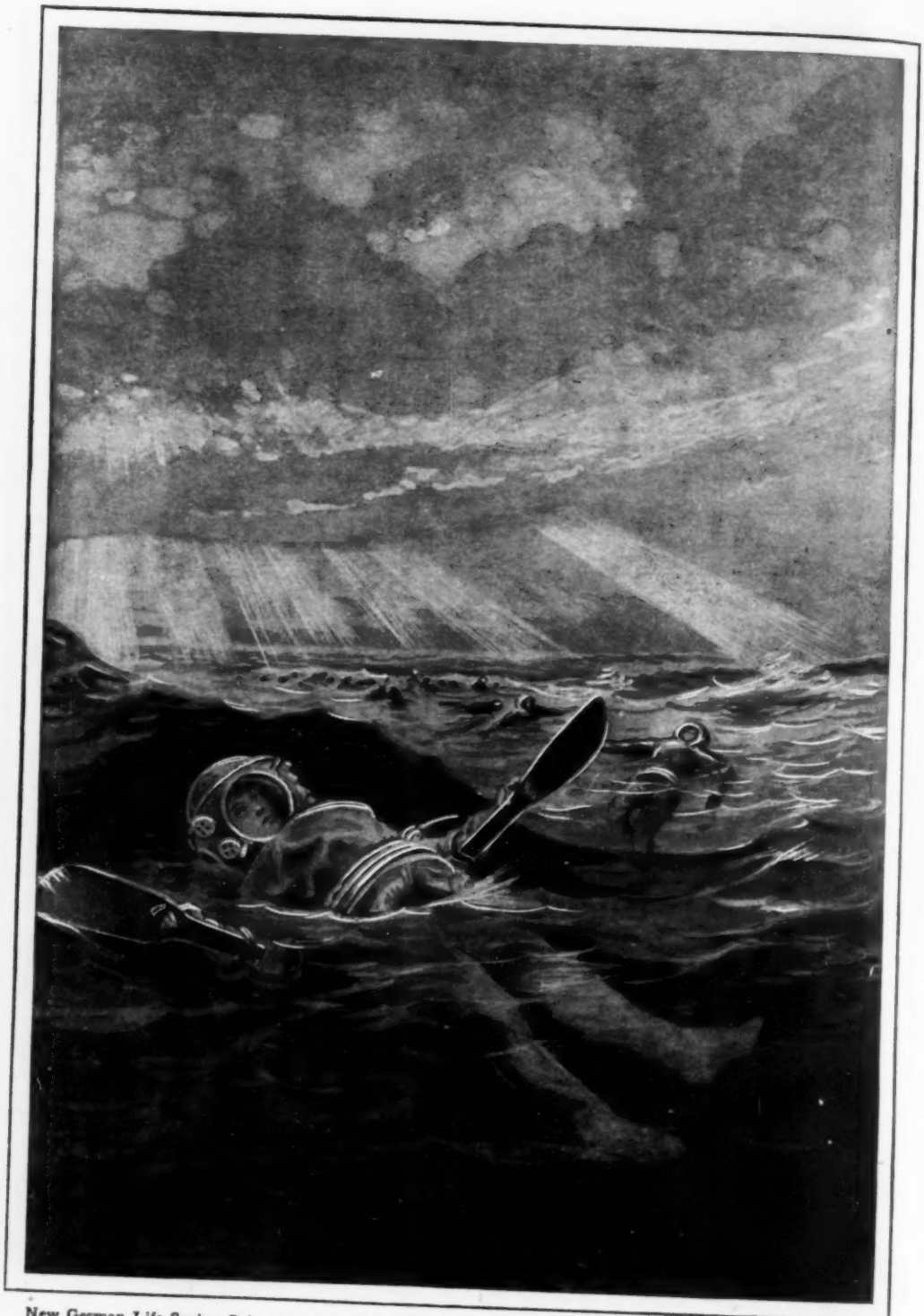


New German Life-Saving Suit with Which the Wearer Can Float on the Surface and Paddle Himself Around with Two Short Blades Attached to the Hands—See Page 544

Popular Mechanics Magazine
REGISTERED IN U. S. PATENT OFFICE
WRITTEN SO YOU CAN UNDERSTAND IT
Vol. 47 APRIL, 1927 No. 4

CAN you imagine a train thundering over the rails at a speed of eighty-five miles an hour, approaching a red danger signal and coming to a halt with the engineer sitting motionless in his cab without attempting to stop the train?

You wouldn't believe it possible, but the Philadelphia and Reading railroad gave such a demonstration recently of its new train-control system, by which it is hoped to make railway service practically fool-proof.

The system enforces obedience to signals and compliance with speed regulations. It applies the brakes automatically, if the engineer exceeds eighty-five miles an hour, or when he goes above forty miles an hour, when caution signals are against him, and again when he travels more than twenty-five miles an hour under danger-signal indications.

A broken rail or open switch ahead will cause a brake application. If the engineman does not comply with all signal indications and speed regulations, the brakes will bring the train to a stop. Any time the system or equipment fails, the train will be brought to a halt.

A device, inclosed in a steel box and attached to the locomotive, is operated by an electrical current flowing through the rails, which are divided into sections or blocks, each 4,500 feet long. Contact is made by receivers suspended from the front of the locomotive, six inches above the rails, by induction. The electricity

travels to the equipment case, containing relays, radio-amplifying tubes, where it is stepped up to high voltage and carried to the braking system.

This train control also provides the engineer with a continuous, visible indicator in the cab, from which to determine at all times what speed he may run. Any changes in the condition of the track ahead of him are instantly registered on his cab indicator in sufficient time to enable him to increase or decrease his speed. In short, when the indicator shows an "H" (high speed), he may run at eighty-five miles an hour; when it shows an "M" (medium speed), he may run at forty miles an hour and when "L" (low speed) appears, he must keep his speed within twenty-five miles an hour. If something unforeseen happens ahead of the train, instant warning is given and the brakes will be automatically applied.

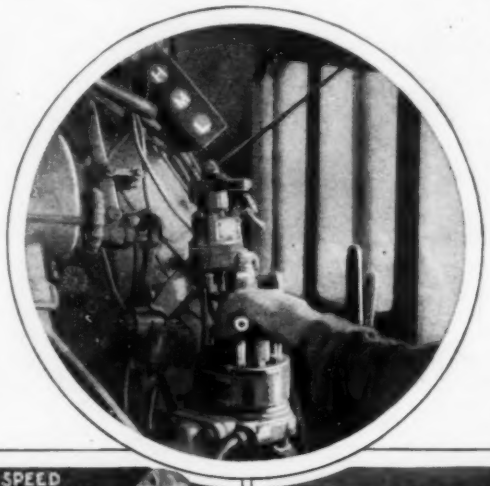
The train-control system is operated in conjunction with automatic block signaling, thus regulating the speed of the train to conform with signal indications. So long as the engineer complies with the signals, the control of the train is left entirely in his hands, but should he fail to recognize them, the system takes hold and either stops the train or reduces its speed. In such cases it applies the brakes but never releases them.

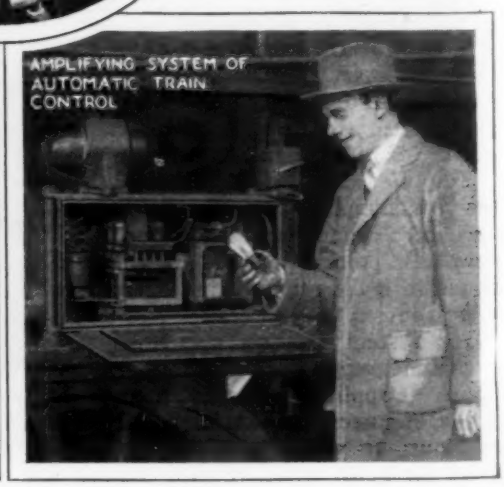
After the brakes have been applied, the engineman has to release them by operating the acknowledging valve, to prove he is alert and in full possession of his faculties. The brakes hold for forty seconds, before they can be released, thus insuring that the train will be brought below the required speed limit.

Such, then, is the system of the automatic train control. Should the engineman die or fall out of his cab, there is no danger of a wreck, killing or injuring passengers riding in a train so equipped.

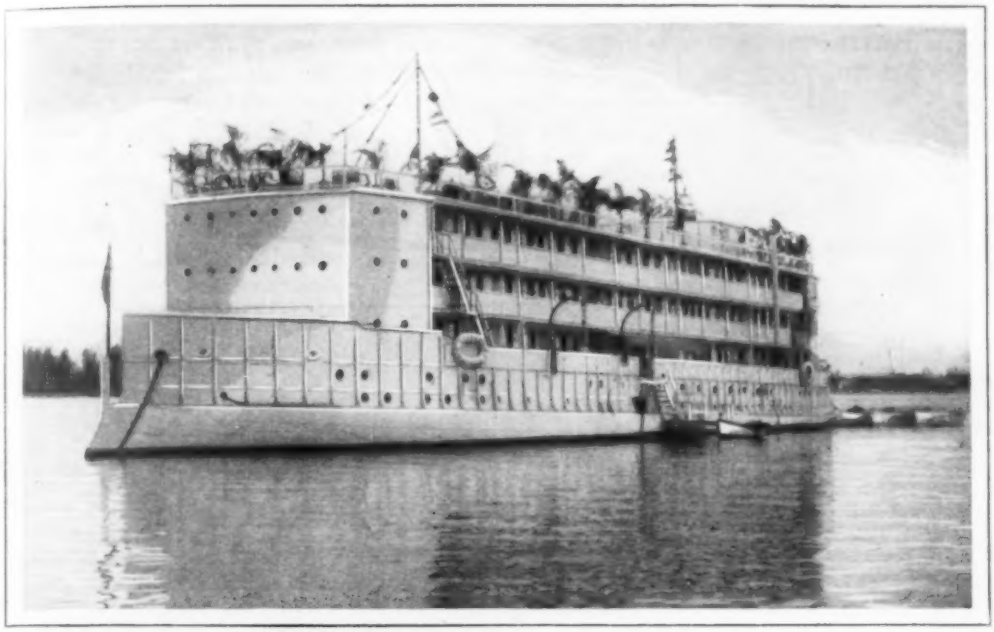
But a vast amount of work remains to be done on the invention, before it can be used on all railroads. The present cost is very close to $14,000 a mile. Then again there is the upkeep of the track. Railroad engineers, however, are working day and night to improve the device and lower the cost of maintenance.

Then will such catastrophes as rear-end collisions in fogs, derailments and other accidents that take a toll of human lives, be eliminated.





FROM AN ARMORED WARSHIP TO A FLORIDA HOTEL



Once a Battleship and Now a Floating Hotel, the Experimental Vessel "Amphritrite" as It Appears Remodeled and Anchored on Lake Worth near Palm Beach, Florida

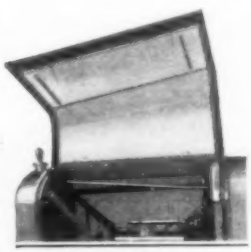
Instead of being scrapped—the fate of most old war vessels—the "Amphitrite," an experimental battleship on which the government spent several million dollars, has been converted into a floating hotel. It is now anchored on Lake Worth near Palm Beach, Fla., and has been comfortably arranged to accommodate a large number of guests in suites of rooms equipped with every modern convenience. A large roof garden, hotel connections to the mainland and numerous promenades are special features.

BOOKS WITH COPPER LEAVES IN ODD COLLECTION

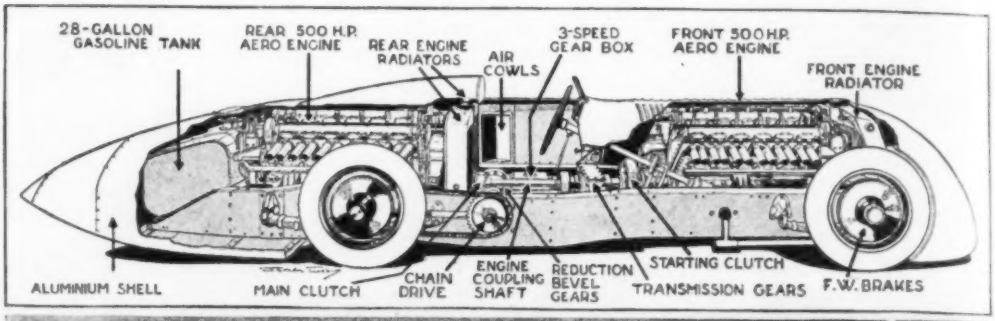
Books with palm leaves and strips of copper for pages, others measuring a yard in length, some written on vellum and silk, stitched, folded and rolled volumes as well as many other curious publications were exhibited recently at the Newberry library in Chicago. One of the most interesting specimens was bound between wooden endpieces and richly decorated in gold and lacquer on twelve thin copper sheets, about twice the size of an average automobile license plate. A Sanscrit manuscript was bound in elephant hide and others had been laboriously written on parchment or silk. A Turkish book, written between 1600 and 1658, contained an account of the discovery of America. The character of the workmanship on some of the religious volumes was indicated by the kind of ink used.

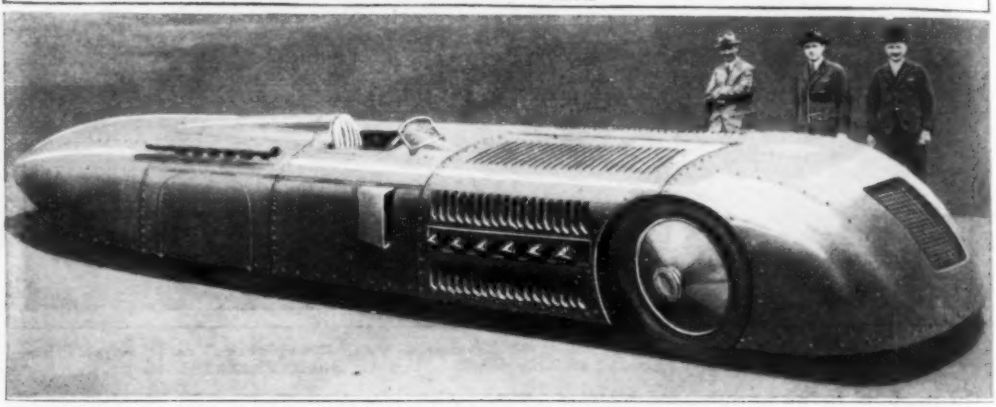
HOOD LINING PROTECTS MOTOR AND SAVES FINISH

To reduce the likelihood of freezing in cold weather and to obtain greater efficiency from the motor, a felt and asbestos lining material for the auto hood has been placed on the market. It also protects the paint by maintaining a more even temperature on the outer surface. The lining is so fashioned that the sides which cover the louvers can be removed quickly when driving in hot weather to prevent overheating.



HAZARDS IN DRIVING MONSTER SPEED AUTOMOBILE





More Than Thirty Feet in Length, This Double-Engined, 1,000-Horsepower Racer Is Expected to Travel Faster Than 200 Miles an Hour over the Sands at Daytona Beach

The new racing automobile, built in England for Maj. H. O. D. Seagrave, to seek speed records on the sands of Daytona beach, Fla., with twenty-five miles of hard-packed straightaway, has two motors developing 1,000 horsepower. The big car had to be brought to America to be let out to full speed because there was no course in England large enough on which to try it. While Maj. Seagrave only expected to make a 200-mile-an-hour record, the car was actually designed for a speed of 220 miles. The present international record of 170 miles an hour is held by an Englishman, J. G. Parry Thomas, though several American drivers have made unofficial records higher than that. The new Seagrave car was built to better these unofficial marks. The builders encountered several unusual problems in constructing the giant, which has one engine over the front axle and one over the rear. They had to modify their body design considerably when they discovered that the car not only had the usual tendency to leave the ground and fly, which has been encountered with other cars tested at Daytona, but that the rear end wanted to fly higher and faster than the front, with the result that the car would have turned a somersault long before reaching full speed. Another problem was the effect of the wind pressure if the car should be turned slightly out of a straight path while going 200 miles an hour. They found, in experiments, that if the machine deviated as little as ten degrees from a straight course, the enormous wind pressure would turn it around. Experts were consulted to determine how long it took the muscles to answer a signal from the brain, the answer being four-tenths of a second. In that time, at 200 miles an hour, the car would have traveled 120 feet, so it was decided that it would be utterly impossible for the driver to come out of a skid in the usual way if the car should go into one. The body of the unusual car incloses everything, even the wheels, to get away from the wind resistance the tires offer. The two engines, when fully out,

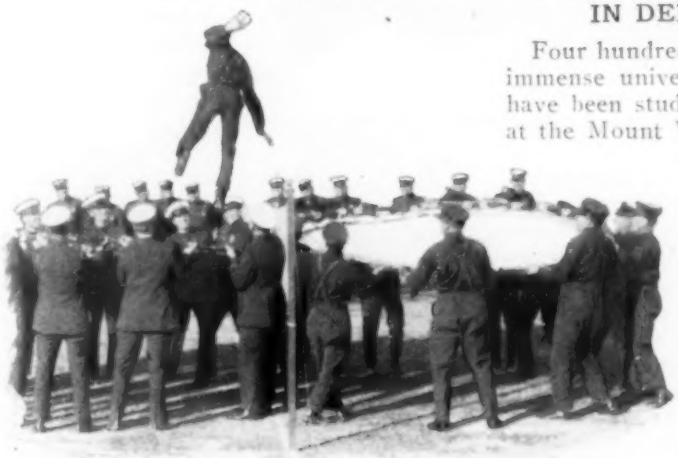
will consume four gallons of gasoline a minute. Seagraves, who is still in his twenties, has been famous abroad for several years because of the frequent records he has set up driving special racing automobiles.

WEATHER STRIP EASILY PUT ON ELIMINATES RATTLING

Several advantages are claimed for an improved kind of weather strip in that it can be applied by a novice, is thoroughly insulated against temperatures and moisture by a rubberized-fabric covering and requires only a hammer and tacks for installation. Being flexible, it is simple to adjust around corners, saving the trouble of mitering, sawing and waste, and it acts as a cushion to keep windows and door from rattling. It also keeps out dust so that it is suitable for use the year around.

GAME OF HUMAN VOLLEY BALL LATEST OUTDOOR SPORT

Firemen and policemen, training for an athletic festival in Los Angeles, introduced something new in sports when they tossed a comrade back and forth in a vigorous version of volley ball. Life nets were used on both sides of a mesh barrier like that used in tennis and, besides affording amusement to spectators and players alike, the game gave excellent training in the use of the nets, which are often the means of saving lives at fires.



Over the Mesh from One Life Net to the Other; a Game of Human Volley Ball in Progress at Los Angeles

SOUND BOX PRODUCES SLEEP BY MONOTONOUS NOISE

Based on the fact that a softly humming, monotonous sound often serves to induce sleep, a clockwork apparatus patented by a German doctor produces the desired noise for about forty minutes after winding. In order not to awaken the person using it by an abrupt cessation of the sound, this gradually becomes weaker until it finally dies away. The outfit is contained in a small ornamental box which can be placed near the subject.

Hum from the Ornamental Box on Table Produces a Soothing Effect to Induce Sleep

UNIVERSES OF STARS FOUND IN DEPTHS OF SPACE

Four hundred spiral groupings of stars, immense universes far beyond our own, have been studied by Dr. Edwin Hubble at the Mount Wilson observatory. Their average diameter is placed at 5,700 light years, one light year being about six thousand billion miles, and they are two hundred million times as bright as our sun, according to the astronomer. He also states that it has taken something like a million years for their light to reach the giant telescope where they were photographed.

HARPOON GUN DEVELOPED FOR OCEAN FISHERMEN

Old Army Carbine Converted into Harpoon Gun for Fishing; Close View of Dart and the Entire Outfit

Fishing for tarpon, sailfish, shark, porpoise, swordfish and other deep-sea game with a rifle harpoon is the latest sport among owners of fast seagoing motorboats. The harpooner, with practice, it is claimed, can hit a six-inch target at fifty feet, which makes it quite easy to approach within firing range of fish basking near the surface. The basis of the harpoon outfit is the firing mechanism and stock of a Springfield .45-70-caliber cavalry carbine of the 1873 model, fitted with a special barrel, short and much heavier than usual, with a clear, unrifled bore. The harpoon sticks are short lengths of dowel rod, one end of which slips into the barrel and rests on the end of a blank cartridge, loaded with forty-five grains of black powder. At the other end of the stick, the harpoon head is loosely fitted. It consists of a bronze spear with two barbs nearly an inch and a half across. Two fingers extending from the head slip alongside the front sight and keep the harpoon lined up until it is shot. A length of wire leader is fastened to the shot line, of which two hanks, containing 300 feet of light line and 150 feet of heavy, come with the gun. In action the harpooner coils the line in a keg or bucket, placed to leeward so that it will not blow back and become tangled with his legs

while running out. One end is attached to the wire leader and the other to a keg buoy, which can be tossed overboard after the line runs out to mark the position of the fish. The gun is provided with an adjustable elevated rear sight to enable the gunner to offset the downward pull of the line.

TALKING MOVIES BY INVISIBLE LIGHT

Promise of further use of the invisible rays of the spectrum is seen as the result of experiments in employing them to transmit sounds and to project motion pictures. A physics professor at the Massachusetts institute of technology recently showed that the invisible rays could be harnessed to the movies. The pictures were invisible until they sprang into sight on a fluorescent screen. From the success of this experiment, it has been suggested that automobile headlights could project the invisible rays and yet expose autos, bridges, fences and other objects at night if they were covered with a substance which would have a luminous reaction under the influence of the rays.

Dr. Donald C. Stockbarger with Part of His Apparatus for Projecting Movies and Sound by Invisible Rays

Copyright, Herbert Photos

Where Electricity Leaps a Mountain Canyon; Conduit over Stream in the French Alps More Economical than Cable Span

BRIDGE FOR ELECTRICITY SPANS WIDE MOUNTAIN CHASM

Electric current is supplied to a number of towns in the French Alps through a conduit that at one place in its course, assumes the form of a unique bridge across a deep mountain canyon. Constructing the duct required considerable engineering skill, but the bridge plan saved the expense of extra cable which would have been required in leading the line down and up the sides of the chasm.

ARTESIAN WELLS HEAT HOMES AND PROTECT CROPS

Ranchers near Reno, Nev., are utilizing natural hot water, found in drilling to depths of 100 to 120 feet, for heating their homes and for irrigating to help protect various produce from frosts. The water has a temperature of about 200 degrees Fahrenheit and appears abundant.

Samuel M. Greer, Left, and John W. O'Leary, President of the U. S. Chamber of Commerce, with Map of Phone Lines

NET OF LONG-DISTANCE PHONES LINKS ENTIRE COUNTRY

The widespread use of the telephone in this country is emphasized not only by the number of instruments in service but by the special long-distance lines which have been installed to speed communication. With the completion, a few weeks ago, of the line linking Seattle, Wash., with the system, hardly any large section of the country is now isolated from long-distance service, as may be seen from the accompanying map.

WAVES AND SUN HARNESSED TO LIGHT BUOYS

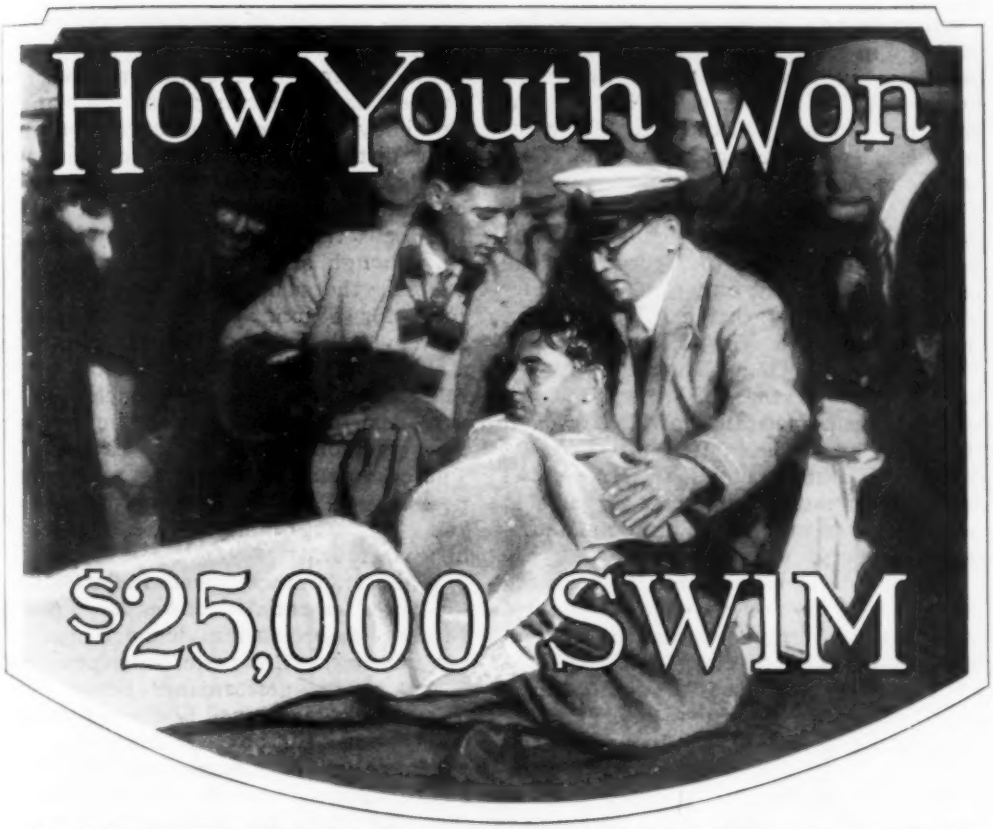
Thousands of dollars are saved yearly by means of the so-called sun valve which automatically lights the lamps on gas buoys and in lighthouses for the protection of shipping. It saves employing many men for the task and is certain of operation. It is so adjusted that when darkness falls, the flow of acetylene gas stored in a large container, is increased. Daylight turns the gas nearly off so that it burns low during the bright hours. Another form of buoy utilizes the action of the waves to operate a pump which in turn affords water for running a small turbine to supply electricity for illuminating the light. Fog horns or moaning buoys are also rigged to work without the aid of man. Compressed air is furnished by means of a pump actuated by the waves. The only attention required is an occasional oiling. A lightship on the west coast of Scotland has no crew. Its light burns without care and when the vessel rolls, a bell strikes. Dutch engineers have also harnessed the sea to help strengthen the dikes. Jetties are built of reeds, running outward from the embankments. These gradually become covered with sand, owing to the action of the waves, and by constructing successive jetties after others have become covered, a strong reinforcement for the dike is soon laid down.

TATTOO INSTEAD OF LIPSTICK GIVES PERMANENT EFFECT

Tattooed lips, marked in "Cupid's bow" pattern of red, are reported to be the latest beauty fad in California, regardless of the pain that accompanies the operation. The effect is permanent, saving repeated applications of the lipstick.

Applying the Make-Up That Lasts; the Tattoo Needle Adapted as Substitute for Lipstick

How Youth Won $25,000 Swim



Safe and Warm on Shore, Victor of the Long Battle with Tides and Chilling Currents; Young, as He Appeared a Few Moments After He Had Conquered the Catalina Channel

By JOHN ANSON FORD

WHEN George Young, the seventeen-year-old Canadian boy, swam the Catalina island channel to the California mainland, in fifteen hours, forty-seven minutes and thirty seconds, he made a record that stands as one of the greatest and most spectacular feats in the history of athletics.

There were 102 contestants and a first prize of $25,000. At the start, Young, who had ridden most of the distance from Toronto to California on a motorcycle in company with a pal, was looked upon as merely one more of the big company of unprepared participants who were not aware of the terrific odds against them.

A great many things have been cited as being responsible for the Canadian lad's astonishing victory, but all the worth-while factors simmer down to just three, and these are worthy of study by any young person who may be dreaming of winning honors in swimming—endurance, speed, skill.

All his life, Young has helped to support his widowed mother. The beautiful, but cold lakes of northern Ontario's resort district contributed a lot to his endurance. The result was that Catalina channel, in spite of its comparatively low temperature, could not freeze him out.

Speed has been the second element in Young's success. It saved the day for him in the cold channel. It kept him warm and it got him out of the water several hours before many forecasters thought it possible to cross the channel. His self-confidence was well illustrated in a before-the-race talk he had with Capt. Harry Huff, of the tug "Martha," which had been engaged to convoy George. "Meet me just outside the bay,"

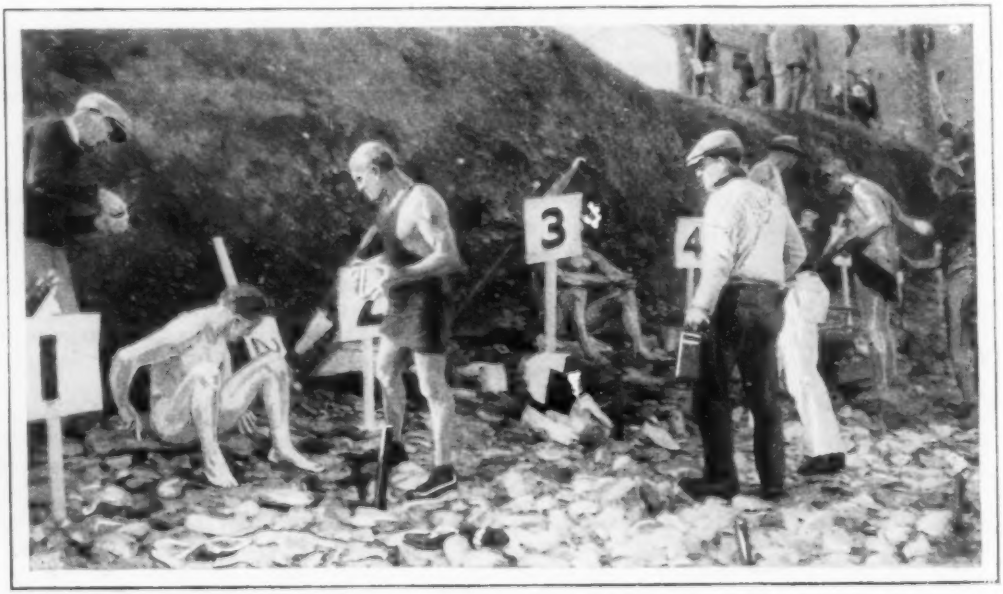
—referring to the starting place—the boy had said in giving instructions. "But how will we know you from all the other swimmers?" Huff asked. "Pick out the man first to pass Bird Rock, 300 yards outside the cove," George answered, "That will be me."

But speed and endurance would not have won without amazing skill. Some people have referred to George's stroke as "the Carlton." Young and his trainer say this is hardly correct. They stated that George had gotten some helpful ideas from the young Australian swimmer, Carlton, but that the stroke used was the straight American crawl. However, there is as much difference between Young's execution of the American crawl and that of most swimmers, as there is between Paderewski's and an amateur's performance on a piano.

The crawl is what gives George his great speed. In non-technical terms, the crawl which Young used consists of alternate strokes with the right and left arm, while the legs keep up a continual flutter or kicking from the hips. The arm is brought out of the water, thrust forward and then swung downward and backward through the water until the hand is back near the hip. In the latter position the elbow is somewhat bent to assist in raising the arm out of the water and thrusting it forward again.

The general direction of the motion of the feet, is at right angles to the plane of the body, the heels rising to within a short distance of the surface of the water. While the movement of the legs is almost continuous, the expert learns to so use the limbs that each benefits by a recurring though short moment of rest, thus enabling the swimmer to keep up his efforts for a long period of time. The movement is largely from the hips, with a slight bend in the knees and the ankles relaxed. In fast swimming, such as a 220-yard dash or longer spurts, the legs will give eight or more kicks to each stroke, whereas in slower swimming, such as was necessary in the channel, the number of kicks per stroke may be reduced to as little as four.

While endurance, speed and skill were the three essential features of Young's success, co-ordination, balance and relaxation were the underlying principles on which his performance rested. The three things mentioned first were possible only because the boy had learned perfect co-ordination of the arm and leg movements I have described, with his breathing. Many amateur swimmers instinctively develop this timing of the breathing

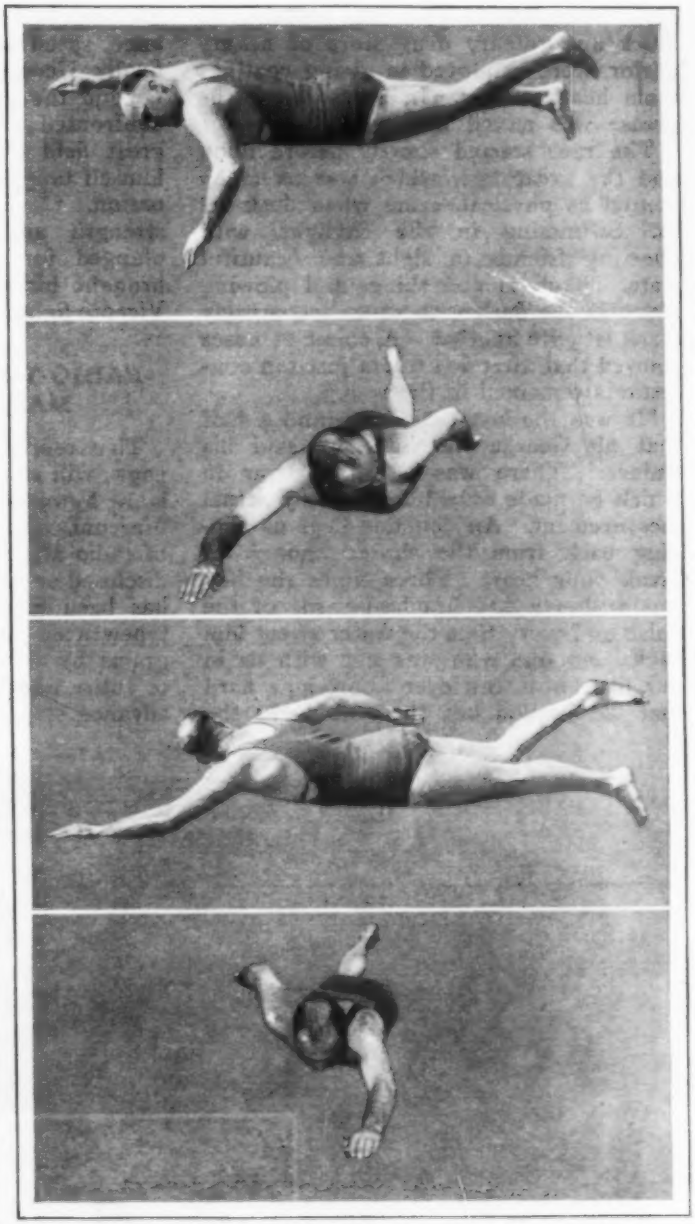


Greasing-Up before the Swim; Enough Creams and Lubricants Were Used to Stock a Store as Contestants Sought a Protecting Covering from the Cold Waters

with the movement of their limbs, yet many others never get it, and so are always out of breath or lack endurance. Balance is also a vital factor, for in that way no part of the body is taxed unduly and the energy exerted operates to the best advantage. In a long-distance swim perhaps the art of relaxation is of even greater importance. Without it cramps are certain to develop.

Mental poise accompanies, or perhaps creates, the capacity to relax. George says he never doubted his ability to reach the goal, though during the age-long hours of the dark night, it must have seemed a hundred miles away. As the lad blushingly stood before a crowd and modestly tried to tell how he swam his way to victory, one could detect this poise that stood him in wonderful stead during the great test.

While the regulations prohibited giving the swimmers any physical support while in the water, attendants were allowed to supply the men and women in the race with food. Some trainers devised long poles with tin pans attached to the outer ends. In these solid and liquid foods were placed and held within reach of the human fishes. Others tied long-necked bottles to poles. These bottles, when filled with liquid nourishment, were allowed to float in front of the swimmers so that they could refresh themselves with a minimum of effort. Other devices included long rubber tubes through which liquid was transferred by gravity. Chocolate and soups were the most popular forms of food. Not the least interesting feature of the swim for the spectators was the lavish use of grease. Just before the start of the race, it was apparent that practically every contestant proposed to make his skin impervious to the salt water. Every make of cup grease was in evidence. Va-



Swimmer in Poses Showing Various Positions of the Crawl Stroke Young Used in His Victorious Channel Feat

rious cosmetics, in quantities sufficient to stock an ordinary drug store or beauty parlor, were employed in giving coatings from head to foot. In every case, the grease was mixed with graphite.

The race started shortly before noon and the great test, which was as much mental as physical, came when dusk set in. Swimming in the daylight, with cheering friends in sight and beautiful water about, is one thing, and plowing along in the dark with water menacingly black is quite another. A count of noses showed that after ten hours just ten contestants remained in the water.

"It was the last two hours and a half that hit George the hardest," said his trainer. "There was a whole hour in which he made only 105 yards, by actual measurement. An ebb tide kept us slipping back from the shore; enough to break your heart. Three times the boy was within a few hundred yards of the finish and every time the water swept him back. No one who was not with us in our little boat can ever know how hard that lad battled out there alone in the dark in the cold Pacific. But the endurance, speed and skill of youth won, and finally George thrust his tingling body beyond the grip of the tide, only to be confronted with one more menace—a great field of kelp, in which he found himself tangled before he realized the situation. Once more he summoned his strength and, pulling off the weeds, plunged forward in a final spurt that brought his feet to the rocks of Point Vicente light."

RADIO TO SEND NEWSPAPERS MARCONI PREDICTS

That reproduction of entire newspaper pages will soon be flashed across the Atlantic by wireless, is the opinion of Senator Marconi, who believes that "the wonders of radio are not yet by a long way fully disclosed or even realized." Such progress has been made in sending handwriting, typewritten messages, pictures and diagrams by wireless that the transmission of entire newspaper pages is but a logical advance step, according to the inventor.

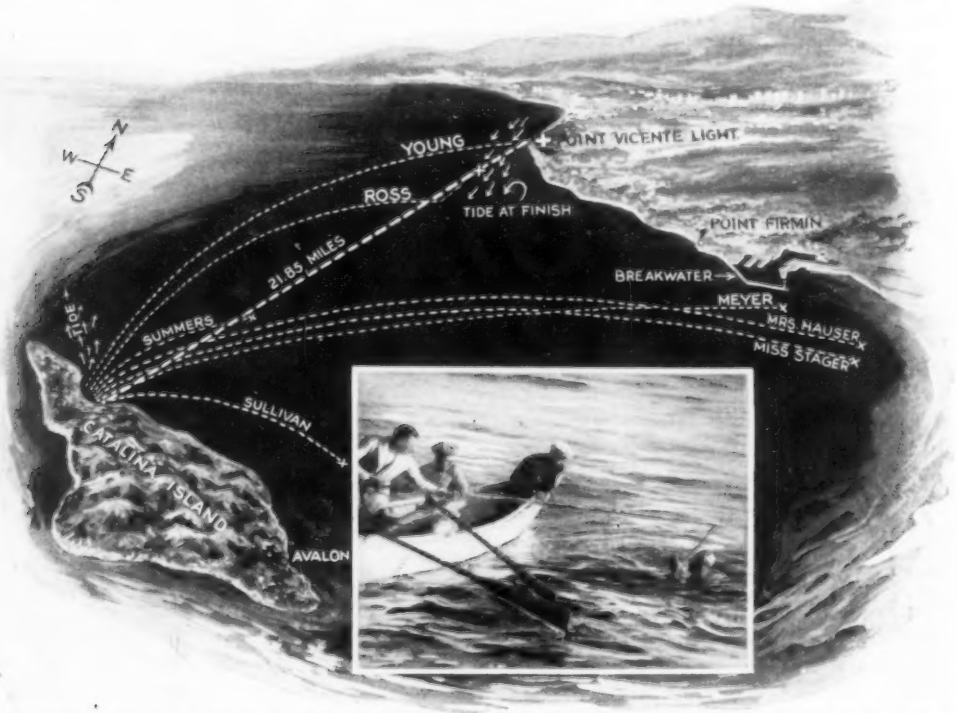


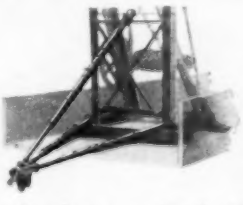
Chart of the Courses Followed by Different Swimmers and Inset Showing a Racer Being Fed from Boat; Note Sullivan's Short Journey; a Few Weeks Later, He Swam the Channel

HOUSE WITH NO FIRE PERIL TO HAVE STEEL FRAME

"Fireproof throughout" is a common phrase in describing the type of construction in various kinds of buildings, but every insurance company knows that the word "fireproof" is generally used in a relative sense and costly blazes occur almost every day in structures that were supposed to be immune from such damage. However, a two-story, seven-room dwelling in Detroit, Mich., is said to deserve the 100-per-cent fireproof stamp, for it has floors of an asbestos composition laid on concrete supported by steel joists, the walls are of steel-frame units connected with insulating material and metal lath on both sides. A three-coat waterproofed stucco covers the outside walls, while the interior is finished in hard plaster on metal lath, with a dead-air space between. Windows have steel sash, the roof is of steel trusses and covered with cement tile; doors, trim, baseboards, picture moldings and chair rail are steel, enameled to represent walnut; the stair stringers and risers are of steel, also enamel-finished, and the treads are cement mortar on metal lath topped with a composition flooring. The builder asserts that the dwelling cost no more than any frame structure of good materials and workmanship built on the same plan.

HITCH PERMITS TOWING AUTOS AT HIGH SPEED

Easily attached to the service car, an adjustable hitch insures greater safety in towing automobiles, as it prevents collisions between the disabled vehicle and the one ahead, and keeps the trailer in line and in the proper position on the street. The hitch consists chiefly of a V-shaped bar of two telescoping members, secured by hooks to brackets which are bolted to the rear of the service car. A clamp, attached to a ball-and-socket joint at the end of the bar, can be connected to the front or back of the car that is to be towed. A triangle hitch is also furnished for use with a crane.



Stationary Running in the Training Treadmill; Pugilist Taking Road Work in the Gymnasium with the Canvas Roller Belt to Push with Feet and Grips to Support Part of the Weight

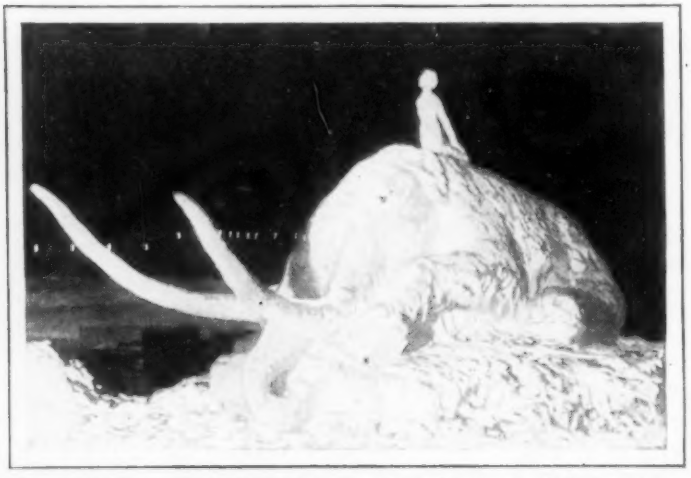
BOXERS TRAIN IN TREADMILL TO DEVELOP BREATHING

Road work is considered important in the pugilist's training, as it develops the lungs and leg muscles and cultivates endurance. Outdoor practice is not always possible because of the weather, so a substitute has been found in a form of stationary running on a canvas belt on rollers. The apparatus is like a treadmill, the user partly supporting himself by handles at the side. Trainers declare that practically the same results can be obtained from the apparatus as from regular road exercise.

¶Helium has been produced in minute quantities from hydrogen in Germany.

ART OF SWISS SNOW SCULPTOR RIVALS WORK IN MARBLE

Along with other winter sports, the art of snow sculpture has become increasingly popular at Arosa, a center of winter fun in Switzerland. Temperature and the texture of the snow are often well suited to the fashioning of beautiful models, as the accompanying illustration of a mammoth and dryad shows. The beauty of the sculpture is best observed at night when lights are thrown upon the models.



Mammoth Surmounted by Dryad Figure, a Snow Creation by Visitors at Swiss Resort Where Winter Sculpture Is Popular

SWALLOW BEE-STING POISON TO TEST ITS POWER

Do the sting of the bee and the bite of the spider help cure rheumatism and other ills? Seeking light on these and similar questions with regard to the insects' poisons, a New York physician has been performing some interesting experiments with fifty college students who swallowed capsules containing sugar of milk, vegetable matter or the poisons. The subjects were not told what they had taken and were asked to report on the effects. Some noted such virulent symptoms that they immediately brought them to the doctor's attention. He was interested to note that virtually all of them were the milk patients and apparently had imagined their ills. The sting of the bee, at least when taken internally, appeared to be less potent than the will to be sick. The size of the potions was increased gradually in order that more definite effects would be obtained.

CHIPS FROM ITALY MAKE MARBLE

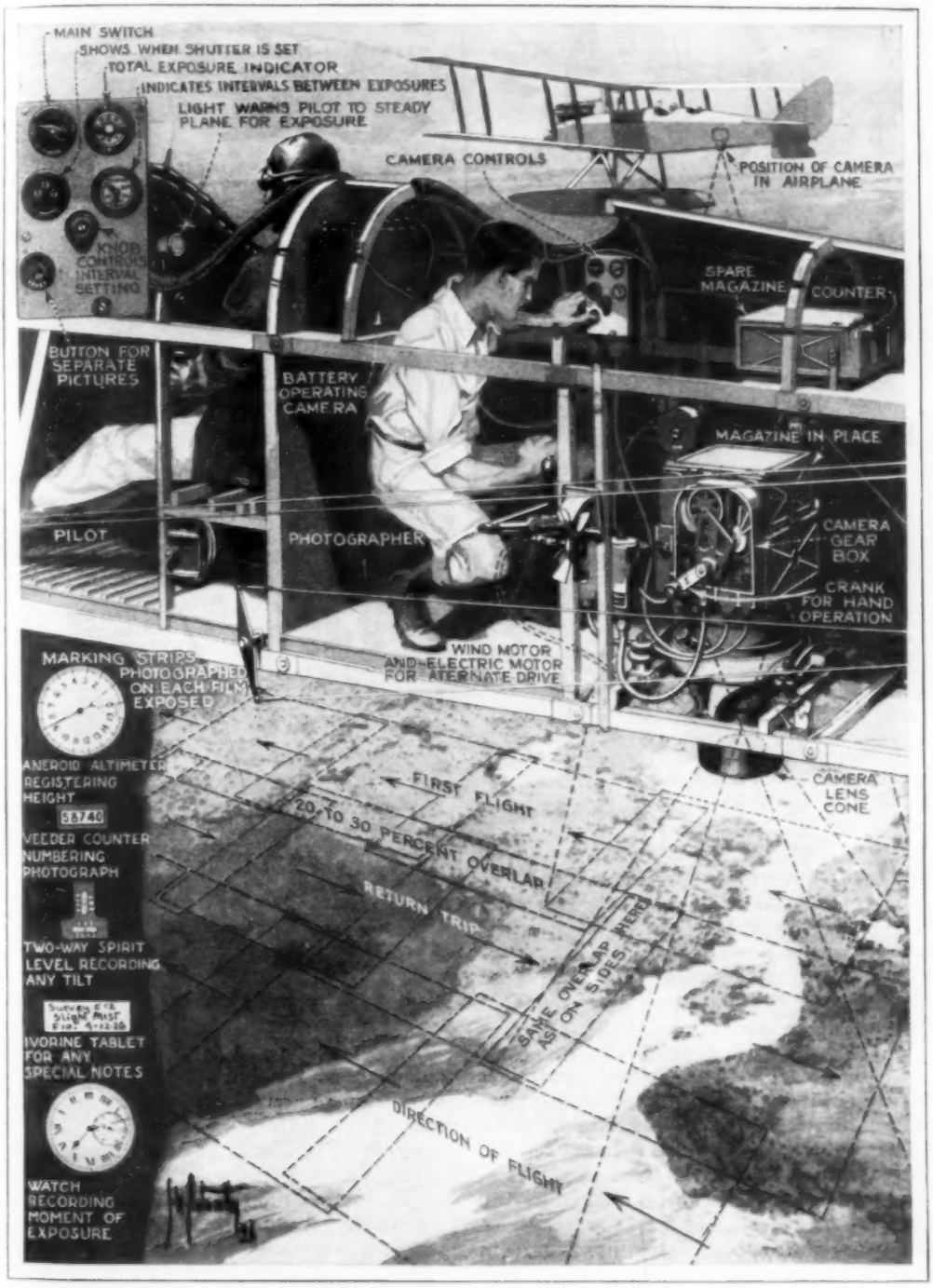
Marble chips, too small to be used for ornamental purposes, are shipped to the United States from Italian quarries, mixed with carefully prepared cement and fashioned into slabs which closely resemble real marble. A realistic texture is obtained by using pigments. Plain slabs are cast on concrete tables, while those with irregular edges are made from plaster casts. When they have hardened, they are rubbed down with sand of silica and then finished with a fine honing stone so that the surface will be smooth. A polish with emery dust gives the required gloss. This "manufactured marble" is widely used for table tops, stairs, floors and walls.

SPEAKING TUBE IN HOUSE DOOR HELPS PROTECT HOME

Using the Door Tube, and Close View of the Attachment with Perforated Mouthpiece

To protect the home against intrusion, a speaking tube in the door gives the inmate of the house opportunity to decide whether the voice of a person outside is familiar or not. It is easily installed, requires no batteries or other connections and is adapted to any kind of door.

AERIAL MAP MAKING WITH ELECTRIC CAMERA



© S. W. Clatworthy

Aerial Map Making Is Made Easier with a New Electrical Camera Which Is Entirely Automatic and Photographs on the Film a Complete Record to Guide in Piecing It Together

LIFE-SAVING SUIT IS BUILT LIKE DIVER'S DRESS

Close-Up of New Life-Saving Dress, with Hinged Window Open

A German Diver Jumping from a Bridge, Above, Wearing a New-Type Life-Preserving Suit Which Makes It Impossible for the Wearer to Stay under the Surface; at the Right, He Has Come to the Top, Opened the Small Window in the Helmet, Fitted to His Hands a Couple of Short Paddles, Which He Had Carried at His Waist, and Is Paddling Himself Along to the Shore

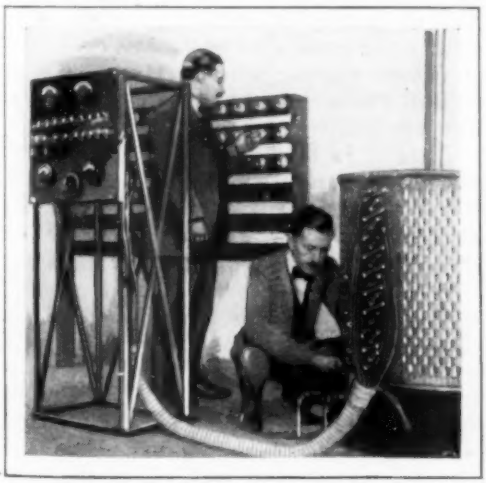
A life preserver which closely resembles a deep-sea diver's outfit has been introduced in Germany. It includes a complete rubberized suit and a helmet of metal, fitted with a window in front of the face, so arranged that it can be opened by the wearer, or closed and made water-tight. In tests, the demonstrator jumped from a high bridge, the fall being great enough to send him several feet under the surface, but, because of the large amount of air the suit contains, its buoyancy was sufficient to send him to the surface almost immediately. As soon as his head was above water, the diver opened the window to replenish the air supply, fitted short paddles to his wrists and hands, and began rowing himself backward to shore. The inventor claims that in event of shipwreck a wearer of the suit could remain afloat indefinitely, even in a storm, by keeping the window closed most of the time and only opening it at favorable moments to replenish the air supply.

AFRICA GETS GIANT TELESCOPE TO SEARCH FOR NEW STARS

Through a huge telescope that has been completed after many months of work, astronomers propose a ten-year search about the skies from an observatory in South Africa for the purpose of measuring the known double stars and to hunt for new ones. The lens for the instrument was made in Pittsburgh and cost $25,000. It will be mounted under an electrically operated fifty-foot dome, costing approximately $30,000.

NOVEL ELECTRIC POWER PLANT REQUIRES NO DYNAMO

Direct current, sufficient to light a forty-room house, is said to have been produced by an electric plant, the parts of which cost only $80 and which makes use of a system of thermocouples instead of a dynamo. The apparatus is the invention of two eastern investigators, who are said to have discovered an alloy of cheap and abundant metals to make the operation and construction of such generating units practical. The principle of producing electricity, by variation of temperature in two different metals, has been known for more than 100 years, but has not been widely adapted because of mechanical and other difficulties. The heat required is furnished by oil, gas or coal burned beneath a cylinder containing the thermocouples.



Electric Plant without Dynamo; Cabinet Containing Thermocouples Seen at Right, Switchboard at Left

Demonstrating the Traffic Signal Which Has Moving Disk, Seen in Top Bracket

TRAFFIC SIGN HAS MOVING DISK FOR STOP AND GO

Lights are supplemented by a moving disk, on which the words "Stop" and "Go" are marked in red and black porcelain enamel, in a traffic sign that also has a bell. The revolving disk is timed to show the signs corresponding to the lights, and the interval is easily regulated according to the volume of traffic. At night, the disk is illuminated with a floodlight so that it can easily be seen at considerable distance. The signal may be operated automatically or by hand.

FIND FIVE NEW KINDS OF FISH IN WESTERN OKLAHOMA

Among five varieties of fish, discovered by members of the University of Oklahoma's zoological expedition in the western part of the state recently, and heretofore unknown, was a third type of black bass. More than 180,000 specimens were gathered on the trip and are being classified for a museum.

Rebuilding America's

Head of the Snake God, One of the Most Used Decorations in the Ancient Mayan City of Chichen-Itza

For four hundred years or more, the ruins have been pawed over by soldiers, priests, adventurers, and, later, trained and amateur archæologists. Now, however, they are not only to give up their last secrets, but one of them, which was once the Mecca of the Maya world, is to be reconstructed as nearly as may be to what it was in its prime.

At Chichen-Itza, the holy city of the Mayas, a party of American archæologists, representing the Carnegie institution of Washington, has embarked on a ten-year reconstruction program, under agreement with the Mexican government that all the art treasures found shall be preserved at the site as part of a Maya museum.

DOWN in the southernmost part of Mexico, in the state of Yucatan, which raises the sisal for American-made harvester twine, a great race of people lived and died nearly a thousand years before Columbus discovered the new world. At their height, they boasted a civilization as great as the ancient Egyptians; they knew more about mathematics and astronomy than any ancient people, and their builders, stone carvers and artisans in precious metals and other craftsmen turned out work the equal of any produced under the Pharaohs.

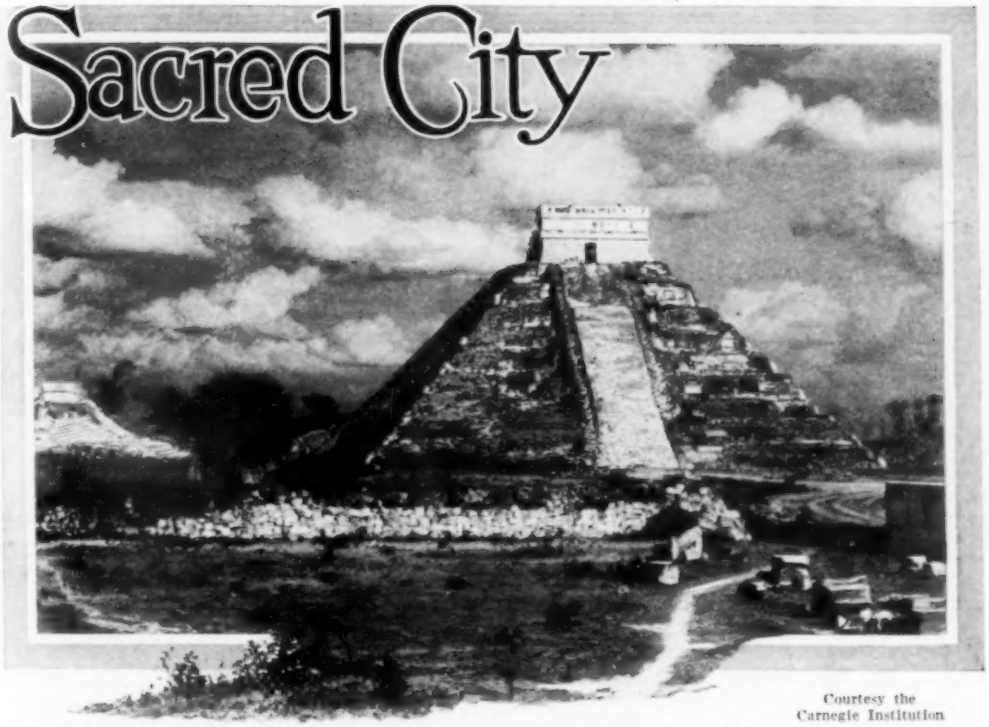
Yet they died and their cities and marvelous temples fell into ruins. Their civilization was lost mainly because they could not cope with the high cost of living, and their towns fell down largely for the reason that they had never learned to build an arch to hold up the roofs. The high cost of living for the Mayas was due to the fact that they possessed no draft animals to plow their fields, and the agricultural methods they used eventually produced a turf so thick and heavy that their plants could not pierce it.

All the first Spaniards found were the decaying ruins of great stone cities, wonderful temples and enormous pyramids.

Chichen-Itza won its fame because it was the possessor of the sacred well in which Maya maidens were sacrificed to Kukulcan, the god of rain. Not only were the living sacrifices hurled into the sacred well as mates for the god, but gold and jade ornaments, beautiful pottery, carved wood, in fact, every kind of possession that its owner held precious, were cast to the waters, as well as an occasional enemy warrior whose valor was considered sufficient to make him an attractive present.

The sacred well is a huge pit, about 180 feet across and 140 feet in depth, with sides that are nearly vertical, or even undercut in places. Fed by underground streams, it maintains an almost constant water level seventy feet below the ground, making the water seventy feet in depth. A stone causeway, reminiscent of the Via Sacra, or Sacred Way, of Rome, leads from the pool of the temple of Kukulcan, a quarter of a mile away. The roadway is thirty feet broad and at places was elevated twenty-five feet above the surrounding plain so that the religious pro-

Sacred City



Courtesy the Carnegie Institution

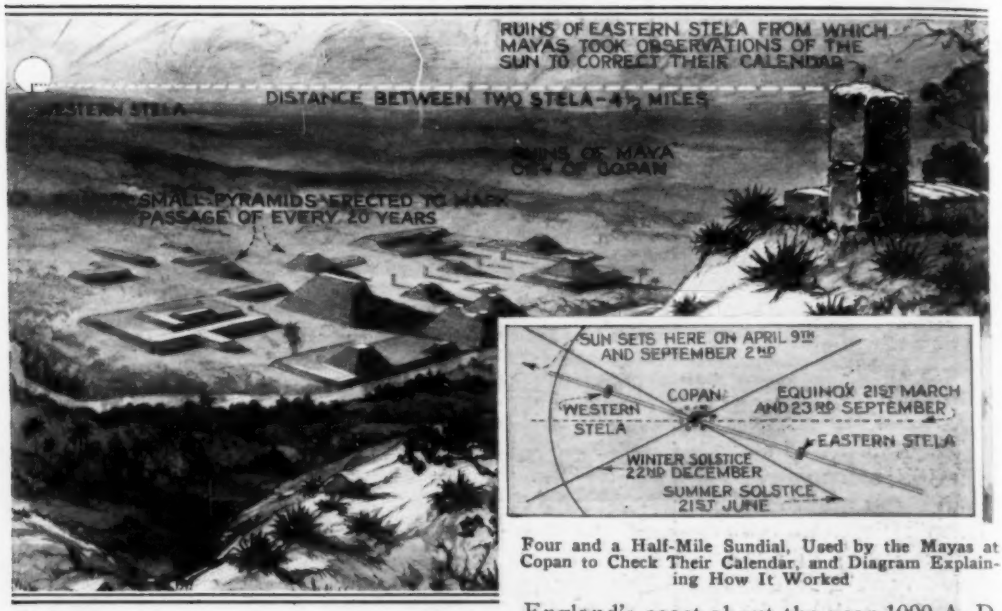
El Castillo, the Great Temple atop a Pyramid, from Which the Religious Processions Advanced to the Sacred Well, to Throw Maidens In as Sacrifices to the Rain God

cessions moving down from the temple were visible to the thousands packed along the way.

The great temple itself rises atop an enormous pyramid, 200 feet square at the base and seventy-five to eighty feet high, the exact height being difficult to measure because of the debris which time and marauding soldiers have piled about the base. The top of the pyramid was leveled off in a stone terrace, sixty feet square, upon which stands the temple. The pyramid construction is typical of all the Mayan buildings. The sides rise steeply at an angle of fifty degrees, being broken into terraces nine feet high, each terrace faced with cut and perfectly matched stones, fitted so well they required no mortar. On each of the four sides a great stone stairway, not quite so steep, breaks the lines of the pyramid. All Mayan stairs are much steeper than we are accustomed to, with very narrow steps, making it almost impossible to climb them wearing modern shoes. The barefooted or sandaled Maya Indians did not need the breadth of stair step we do.

Each of the stairways is flanked on either side with a stone balustrade carved to represent an enormous serpent, the sacred image of Kukulcan, the body flowing down the pyramid in graceful undulations and each fold marking one of the terrace lifts, while the huge stone head, with bared fangs, is raised at the foot to face the approaching visitors. The problem of the ancient Egyptians in moving the huge stones of the pyramids was no greater than the difficulties the Mayas met in carving and placing the huge sections of these serpents. The heads, which represent fabled feather snakes, have enormous open jaws, exposing the fangs and extended forked tongues, every detail correctly carved, and all, with the exception of the tongue, being made from a single piece of rock.

Two more enormous monolithic serpent heads guarded the main entrance to the temple, facing the distant sacred well. They also served as door posts, dividing the entrance way into three sections. The foreshortened heads were the bases of the columns, and the tails were wrought in-


RUINS OF EASTERN STELA FROM WHICH MAYAS TOOK OBSERVATIONS OF THE SUN TO CORRECT THEIR CALENDAR
DISTANCE BETWEEN TWO STELA—4½ MILES
EASTERN STELA
SMALL PYRAMIDS ERECTED TO MARK PASSAGE OF EVERY 20 YEARS
SUN SETS HERE ON APRIL 9TH AND SEPTEMBER 2ND
COPAN
EQUINOX 21ST MARCH AND 23RD SEPTEMBER
WESTERN STELA
EASTERN STELA
WINTER SOLSTICE 22ND DECEMBER
SUMMER SOLSTICE 21ST JUNE

Four and a Half-Mile Sundial, Used by the Mayas at Copan to Check Their Calendar, and Diagram Explaining How It Worked

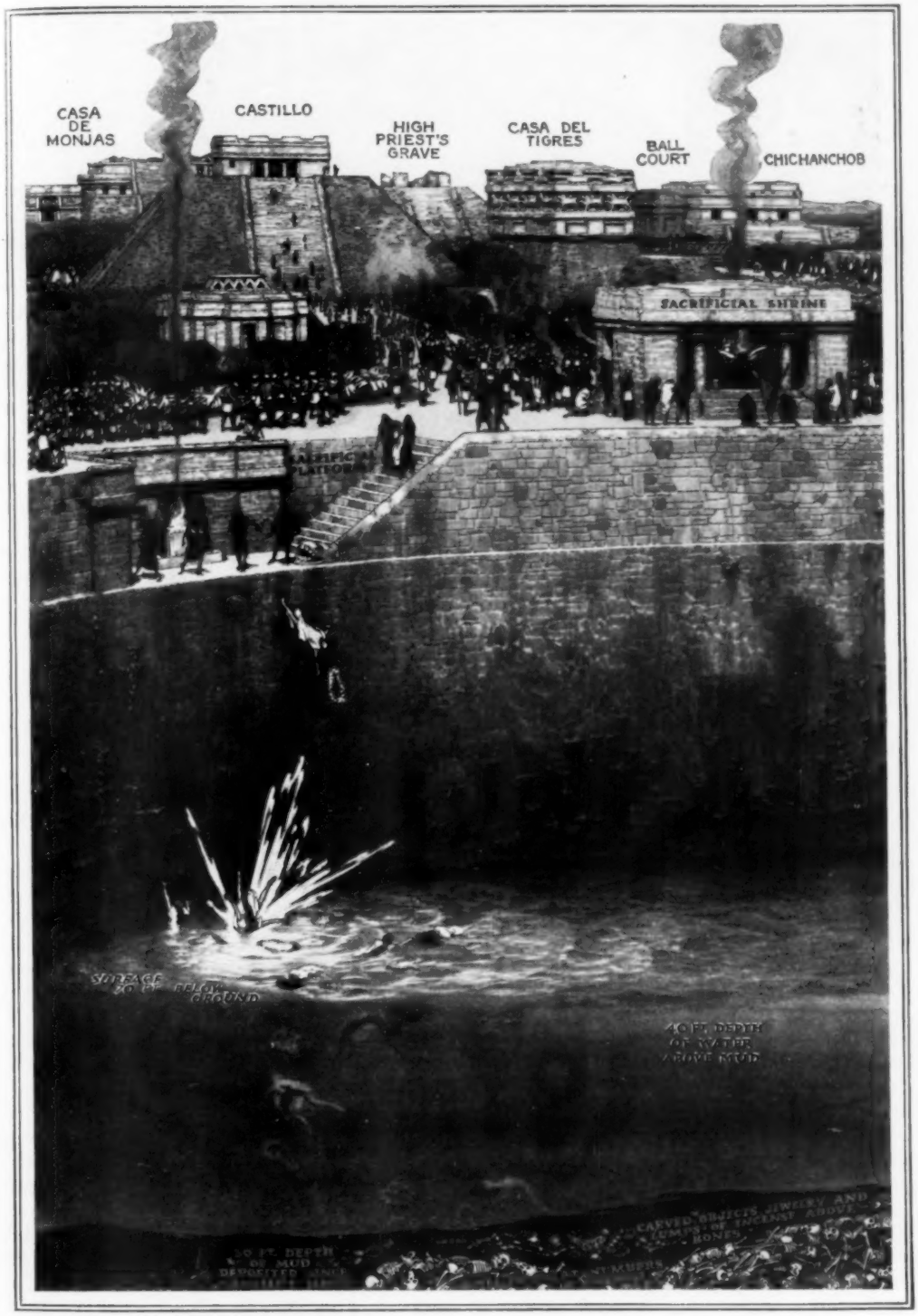
to capitals as graceful as any creation on an ancient Grecian column. The triple-vaulted ceiling of the temple, composed of an enormous weight of carved rock, rested on immense beams hewn from wood of the sapote tree, a wood that is almost as hard and heavy as iron. The beams are elaborately carved.

An enormous stone table, supported by curiously carved human figures, originally stood in front of the main doorway, probably having been used in some sacrificial rite. Curiously, the figures supporting the table and all the carved figures in the temple, covering every column, are bearded—the only bearded figures found in the entire city, built as it was by a beardless race. Close examination, however, indicates that the figures were carved to represent covering masks rather than actual faces, and that it is the masks which carry the beards—a fact that only adds to their mystery.

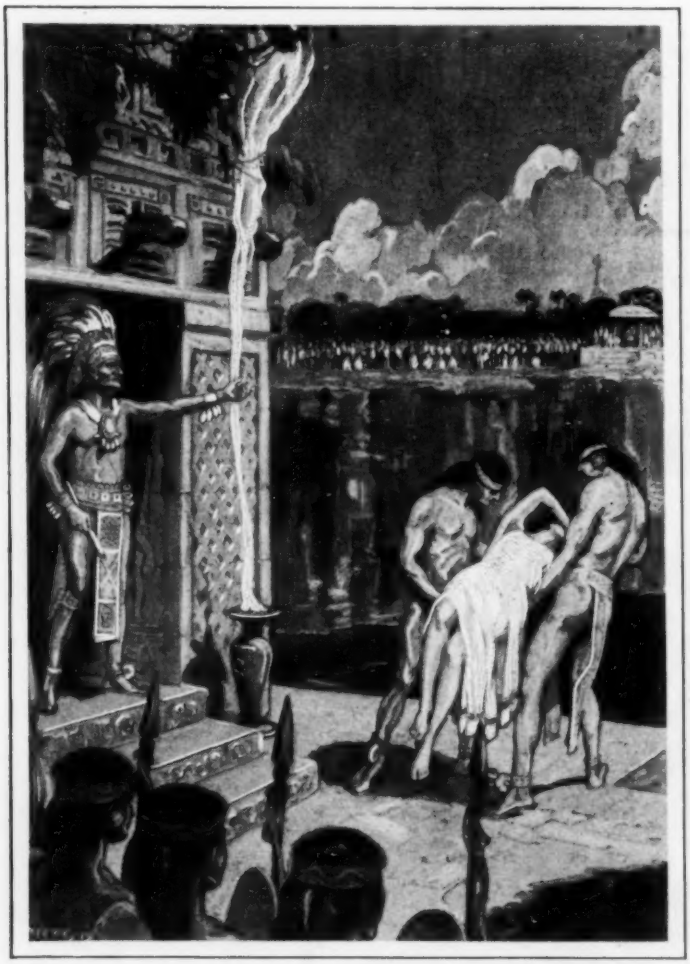
Mayan legends are crammed with stories of a race from beyond the sea, some of the stories indicating that the originals of the bearded figures may have come from the fabled lost continent of Atlantis, while others lead some authorities to believe they may tell of Norsemen who arrived by boat, blown across the ocean long before the time of Leif Ericson, who is reputed to have reached New England's coast about the year 1000 A. D.

Edward H. Thompson, an American who for more than thirty years owned the plantation which includes the ruined city, collected a vast store of wonderfully carved objects, pottery and other relics from the ruins, and, as a climax to his work, dredged and explored the sacred well and brought up not only the bones of more than ninety unfortunate victims of religious sacrifice, but gold and jade and other objects, the metal of which alone would be worth several hundred thousand dollars if melted down. In "The City of the Sacred Well," T. A. Willard, a friend of Thompson's, tells how the archæologists recovered a vast quantity of the treasure with a bucket dredge, and finally donned diving suits and descended to the bottom of the seventy feet of water to search out every last object which it might hold.

Nearly all the pottery, bowls, knives and other instruments and utensils had been broken before being thrown to the rain god, for the Mayas believed that all objects had a soul, and that it was necessary to "kill" them by breaking so that the soul of the utensil could accompany the sacrifice victim to the spirit world. One rare find, however, was a wonderfully carved golden sacrificial knife, which probably had been dropped into the pool by accident. There also



Chichen-Itza's Temples and Sacred Well during a Sacrifice, When the Most Beautiful Maidens Were Hurled into the Water to Be the Brides of the Rain God, as an Artist Reconstructs the Scene

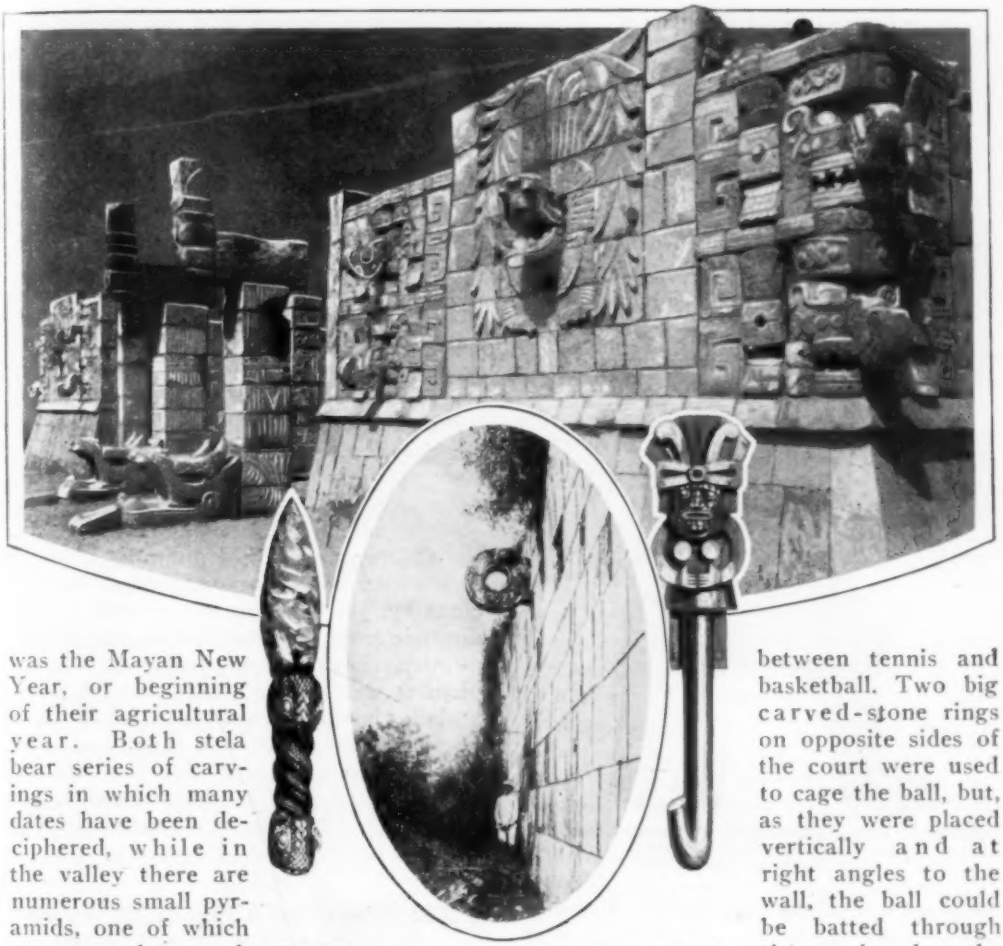


From T. A. Willard's "The City of the Sacred Well," courtesy The Century Company
The Final Rites of Sacrifice Were Performed in a Small Temple beside the Sacred Well

were many beautiful "hul-ches," or throwing sticks, which served the Mayas in lieu of bows. The throwing stick had a handle with a crosspiece somewhat like a sword guard, except that it contained two holes, for the first and middle fingers. The handle fitted in the palm, with the fingers through the holes. The end was curved over, to hold the end of a short javelin, while the shank of the weapon came up inside the palm, ready to be released when the hul-che was brought forward in the throw.

The large number of jade ornaments recovered from the well add to the mystery of the Mayas, but it may be partly solved by the recent discovery of jade in the Pacific northwest, the first time it has ever been found outside of Asia. Previous to that discovery, it was assumed the jade had been brought from Asia over the land bridge that once existed at Bering Strait. Comparison with the American jade, however, may only deepen the riddle.

It is their knowledge of astronomy, mathematics and building, that interests the explorers more than their ornaments and worship. One of the ruins of Chichen-Itza, called the Round Tower or Snail Shell, is unique in that it is one of two buildings of Mayan architecture which were neither square nor oblong. The name snail shell comes from a circular inclosed stairway in the building. It is believed the round tower was an astronomical observatory, and observations made from it show that it was possible to sight through opposite windows and observe stars at certain times when they were twenty degrees above the horizon. Another Maya city, the ruins of Copan, discovered some distance away in Yucatan, has revealed an immense sundial, four and a half miles across, formed by two pillars on hills to the east and west of the city. By sighting from the east to the west stela, or pillar, it was possible to fix the change of the seasons, for the sun set directly behind the western stela on April 9 and September 2. The base of the western pillar has a second depression in which the column formerly was placed, and in that position the sun would set behind it four days earlier in the spring and four days later in the fall, showing that at some period the Mayan calendar had been corrected by simply moving the column. The April date



Implements from T. A. Willard's "The City of the Sacred Well," courtesy The Century Company

Reconstruction by the Carnegie Institution, Above, of Ruined Temples; Below, the Game Court with Stone "Basket" and a Sacrificial Knife and Throwing Stick

was the Mayan New Year, or beginning of their agricultural year. Both stela bear series of carvings in which many dates have been deciphered, while in the valley there are numerous small pyramids, one of which was erected to mark the passage of each twenty years.

The Maya year contained 365 days, but as they had no leap year, it gradually fell behind at the rate of one day every four years. One of the stela bears a date series which is translated as April 5 of our year 471 A. D., while the other bears a date of April 9, ten years later, with the added information that this date was "O Pop" or the Mayan New Year's day. This not only fixes the new year as beginning on the first day of the agricultural year, but likewise indicates that the moving of the stela occurred in that ten-year period.

The Mayas at Chichen-Itza had an enormous athletic court, almost big enough for a football field, in which they played a game that apparently was a cross between tennis and basketball. Two big carved-stone rings on opposite sides of the court were used to cage the ball, but, as they were placed vertically and at right angles to the wall, the ball could be batted through them only when the player stood very close to the wall, a fact that probably required the players to be equally skillful with either hand.

At either end of the court there was a small temple with a portico almost Grecian in its style, and the back of one of these porticos was curved outward to form a perfect sounding board, showing the Mayas knew something of acoustics. A whisper can be heard across the court.

The main work of the Carnegie institution expedition, under Prof. S. G. Morley, is concentrated at present on the reconstruction of the Court of a Thousand Columns, which takes its name from the vast number of columns in it. Already a great throne and many rooms have been uncovered and the walls restored as far

Whether Mayan Sculpture Was of Local Origin or Shows Traces of Influence from Overseas, Is a Question Puzzling to Scientists

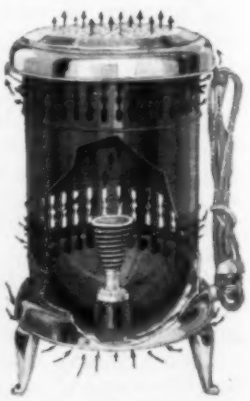
as the ruined masonry can be fitted together again.

The Maya builders never learned to make an arch, so their only way of supporting a vaulted roof or a doorway too wide to take a capstone, lay in utilizing a corbel, a form of construction in which each successive layer projects slightly past the one below it, until eventually the two sides meet. The corbel, however, is not self-supporting, as is an arch with keystone, and as the Maya limestone is soft, it eventually gave way under the burden, which accounts for the complete collapse of so many of their buildings.

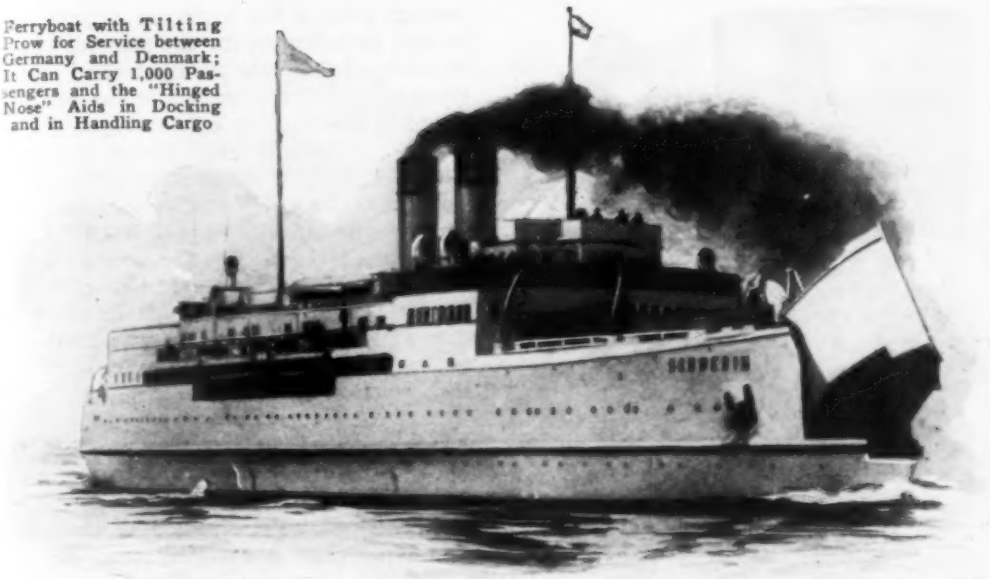
SUBMARINE PHOTOS IN COLORS LATEST PICTURE TRIUMPH

Dangers and difficulties were encountered, but successfully mastered recently, in taking natural-color photographs under the sea off the Florida Keys. Ordinary autochrome plates would not register the moving life under the water, so it was found necessary to make the plates hypersensitive in order that exposures might be reduced to a twentieth of a second. Because of the dampness and excessive heat, this work had to be done at five o'clock in the morning to prevent the emulsion on the plates from melting. But even the hypersensitive plates would not register at depths as much as fifteen feet owing to the reduced power of sunlight; consequently it became necessary to construct a flashlight mechanism which could be operated by the submerged photographer at the right moment. Three small pontoons were built to support a dry-cell battery, reflector and flashlight powder, and the apparatus was so arranged that the diver could handle it and set off the powder. But the assistants who kept pumping fresh air to the man below the surface had to keep close by, yet manage to maintain a safe distance from the powerful charge of flash powder. The camera used in making the pictures was inclosed in a brass case with a plain glass window in front of the lens. Focusing was done with the aid of a reflecting mirror, so that the diver did not have to bend over his instrument, a feat which would have been almost impossible while in his suit and helmet.

ELECTRIC HEATER KEEPS AIR CONSTANTLY IN MOTION



Operated from an electric-light socket, a portable heater has 175 openings at the top, permitting the heat to pass through and upward, so that circulation of the air is maintained as long as the current is on. Tests are reported to have shown that this type of heater will heat a room in one-third of the time required by an ordinary reflector unit. It is not intended to heat the whole house but merely one room, such as an office, bathroom or nursery.



Ferryboat with Tilting Prow for Service between Germany and Denmark; It Can Carry 1,000 Passengers and the "Hinged Nose" Aids in Docking and in Handling Cargo

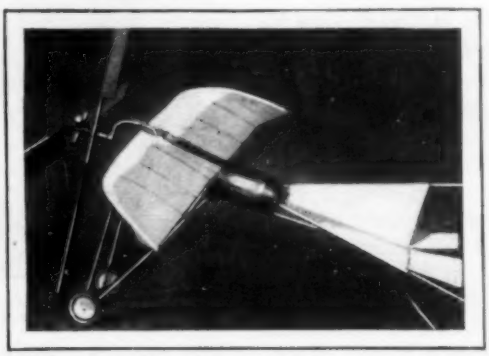
FERRYBOAT HAS TILTING BOW TO SIMPLIFY LOADING

Run by oil-burning motors, a ferryboat operating between Germany and Denmark can carry 1,000 passengers. A special feature is the construction of the bow which tilts up for loading and unloading cargo from the end.

FOOD PROBLEM OF AQUARIUM IS A BIG ONE

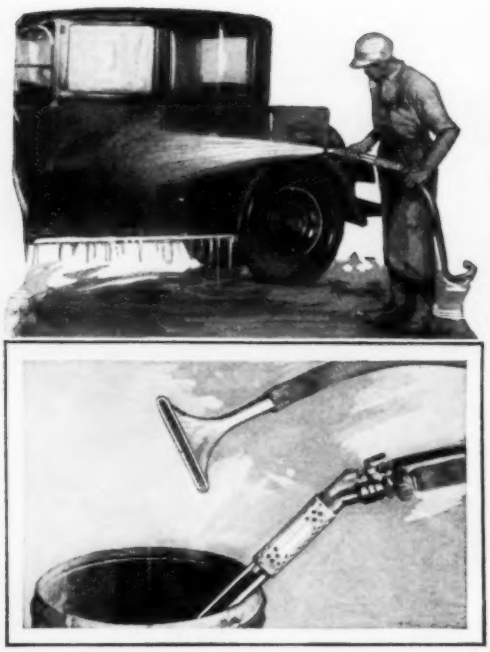
Some fish eat meat or insects, others thrive only on certain vegetables, and still others will consume practically anything edible. Preparing the food for the many species of fish that will be housed in the Shedd aquarium in Chicago, will require two special rooms equipped with refrigerators and other conveniences, it is estimated, while various parts of the world will be drawn upon for the supplies. The seahorse, for instance, is partial to certain varieties of salt-water "bugs," vegetarian fishes have a fondness for lettuce and cracked corn, while many of the smaller ones eat condensed foods such as dry shrimps. Some need an occasional extra "dish" as a variation in the fare; hence it will be necessary to give them snails, angleworms, lobsters, frogs and house flies from time to time. The cannibal fishes will be watched carefully to keep them from indulging their desires, and for others that consume living creatures only, many thousands of minnows and shiners will be kept on hand. The fishes will be fed three times a week.

MODEL PLANE MADE TO ASCEND WITHOUT RUNNING START



Model of Plane for Perpendicular Ascents and Landings; It Is the Work of a Hungarian Inventor

Further progress in perpendicular flying is said to have been made by a Hungarian inventor, who has devised a model plane that can ascend without a running start and descend straight down. If successful, this will eliminate the need of a wide landing field.



Spray Nozzle in Use, and the Vacuum Attachment for Cleaning Automobiles Inside

AUTO SPRAY GUN AND VACUUM SIMPLIFY CLEANING

For cleaning the automobile, inside or out, two simple attachments, intended to be used with the air-compressor outfit, have been devised to reduce labor and save time. One is a spray nozzle through which water is forced to clean all parts of the automobile, and the other is a vacuum-cleaning attachment with a large nozzle and a smaller one for reaching into crevices. Both are said to be adaptable to low-pressure systems.

USING BOTH YOUR HANDS GIVES YOUR BRAIN A REST

About seventeen out of every 100 babies born are naturally right-handed, three are left-handed and the rest are capable of using either hand with equal ease, it is said. Due to methods of training, by the time the infants are three years old, all except the three who were naturally left-handed will use the right hand for most tasks. It is said that there are more than 400 different kinds of work in which the equal use of both hands is an advantage and, by being able to interchange, a worker affords his brain an opportunity to rest, to a degree, for the muscles of the left side of the body are controlled by the right side of the brain while the left side controls the muscles on the right side of the body. Several famous men have been almost equally efficient with either hand. Landseer, the artist, could paint two pictures at one time, using both hands, Leonardo da Vinci was equally accomplished, as was Holbein, the portrait painter. Sir Oliver Lodge can use both hands with ease and a British surgeon was noted for the fact that he could employ either hand with equal skill in operations.

TABLE AND TYPEWRITER CASE COMBINED IN ONE

Increasing the usefulness of the portable typewriter, a carrying case, devised by a southern school-teacher, is converted into a serviceable table when unfolded. Besides the typewriter, which is taken without its own case, the container has room for writing materials and a small dictionary. Extended, it provides a spread of thirty by twenty-six and one-half inches, and folded, occupies a space of seven by twelve and one-half by fifteen inches. It weighs only eight and one-half pounds. Special catches on the leg joints insure the rigidity of the table.

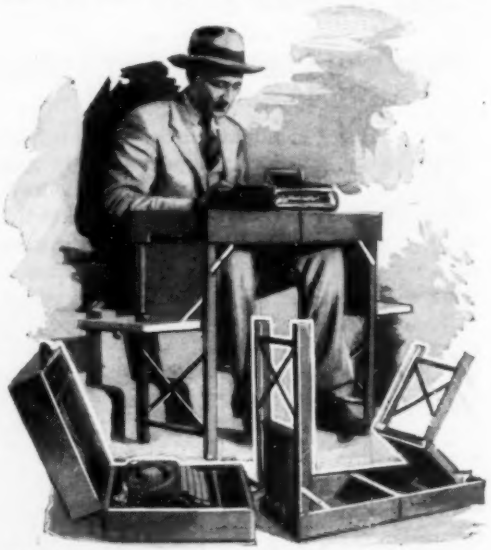


Table Set Up, and Folded as Case to Carry the Portable Typewriter

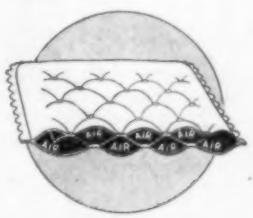
Transforming Insect Bodies into Bits of Jewelry of Varied Pattern and Color; Sample Pieces and Mounting a Specimen; Wax Treatments Help Preserve the Insect Bodies After They Have Been Properly Prepared

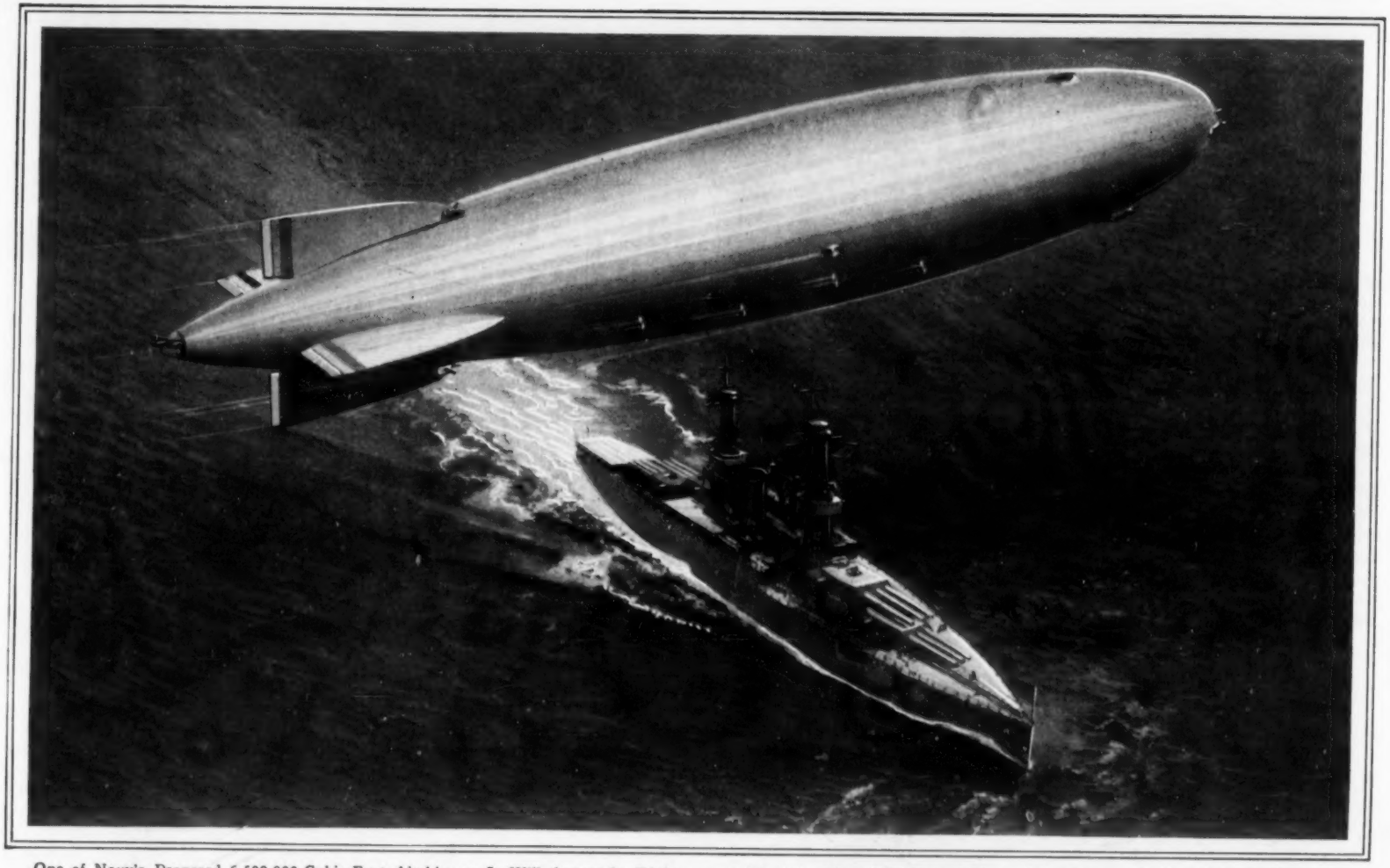
MAKING JEWELRY OF INSECTS NOVEL FRENCH ART

Thousands of butterflies and beetles are converted into brooches, necklaces, earrings and other articles of jewelry by French artisans who are said to be the most skillful in the world in this unique craft. The beetles are carefully sorted, dismembered and then reassembled and treated with wax, to make them suitable for mounting. Butterfly wings are cut into geometric patterns for mosaic designs, under glass. Sometimes the butterflies are inserted whole between sheets of glass for decorating ash trays, etc.

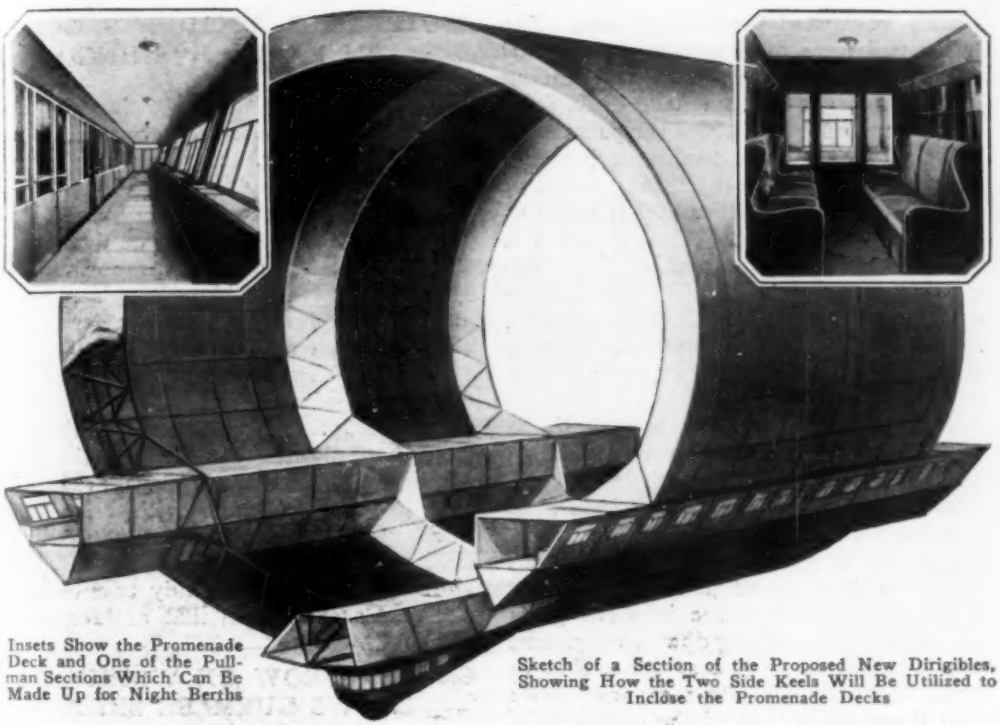
AIR-POCKET CAMPING CUSHION IS EASILY INFLATED

Inflated mattresses and cushions, for camping and other purposes, are not new, but most of them present a bulging surface when blown up, require considerable pressure and are difficult to inflate without a pump. A recently introduced type of equipment of this kind is so constructed that there are a number of inner sections or air chambers, resulting in a tufted and dimpled surface, similar to that of a heavy comforter. The articles can be blown up with the lungs, the load is more evenly distributed, and they are said to be softer than the ordinary kind. Hot-water bottles are also made in this fashion. When filled, the content does not all run to the bottom, causing the bottle to assume a bulging or pear-shaped form, and the tufted bottle may be wrapped about the arm or other portion of the body. The outer side is covered with cloth, and repairs may be made with ordinary automobile-tire patching materials.





One of Navy's Proposed 6,500,000-Cubic-Foot Airships as It Will Appear in Flight over a Warship; They Will Exceed Most of the Largest Surface Ships in Size, and, Unlike the Ill-Fated "Shenandoah," Will Have No Hanging Control Cabin, the Quarters Being Built into the Hull



Insets Show the Promenade Deck and One of the Pullman Sections Which Can Be Made Up for Night Berths

Sketch of a Section of the Proposed New Dirigibles, Showing How the Two Side Keels Will Be Utilized to Inclose the Promenade Decks

Air Liners to Have Cabins in Keels

Two Zeppelins Authorized by Congress Will Be Largest in World and Twice the Size of the Ill-Fated "Shenandoah"

RADICALLY different from airships heretofore built, two giant Zeppelins, plans for which have been completed at the Goodyear-Zeppelin factory in Akron, not only will be twice the size of previous American-owned dirigibles, but will exceed by more than 1,000,000 cubic feet the pair of aerial giants being built by the British government. Congress has authorized the construction of two Zeppelins of 6,500,000 cubic foot capacity each, whereas the new English ships will have but 5,000,000 cubic feet of space.

Profiting by the destruction of the "Shenandoah," and other lessons learned in the past, the plans call for an entirely new form of construction. Instead of a single keel running the length of the ship to tie together all the circular frames that form the hull, the new ships will have three triangular keels, greatly increasing their strength.

The control cabin and passenger accommodations will be inclosed within the hull, as will be the engines. Heretofore the motors have been carried in small gondolas sticking out from the sides of the ship. The plans for the new craft call for inclosed engine rooms, driving the propellers by means of shafts and gears. The arrangement will permit tilting the propellers through a ninety-degree angle to add their upward thrust to the lift of the ship in taking off.

The ships are to have two complete covers, one on the outside of the ring frames and another on the inside, while within the latter will be the gas cells, so arranged that a shot through one or two, deflating them, will not interfere with the operation of the ship.

Two sets of plans have been drawn, one for a purely military ship and the other for a passenger carrier that can be

Unlike the Ill-Fated "Shenandoah," Will Have No Hanging Control Cabin, the Quarters Being Built into the Hull

readily converted for military use. The latter will have accommodations for 100 passengers, with smoking and dining rooms and even a promenade deck, from the glass windows of which the passengers can look down upon the earth beneath. These ships will have a cruising range of 8,000 miles, or 6,000 miles at full speed of ninety miles an hour. At that speed it would be possible to leave New York Saturday morning and arrive in London Monday morning, while the return trip, owing to the prevailing westerly winds, probably would take a day longer, or from Friday to Monday.

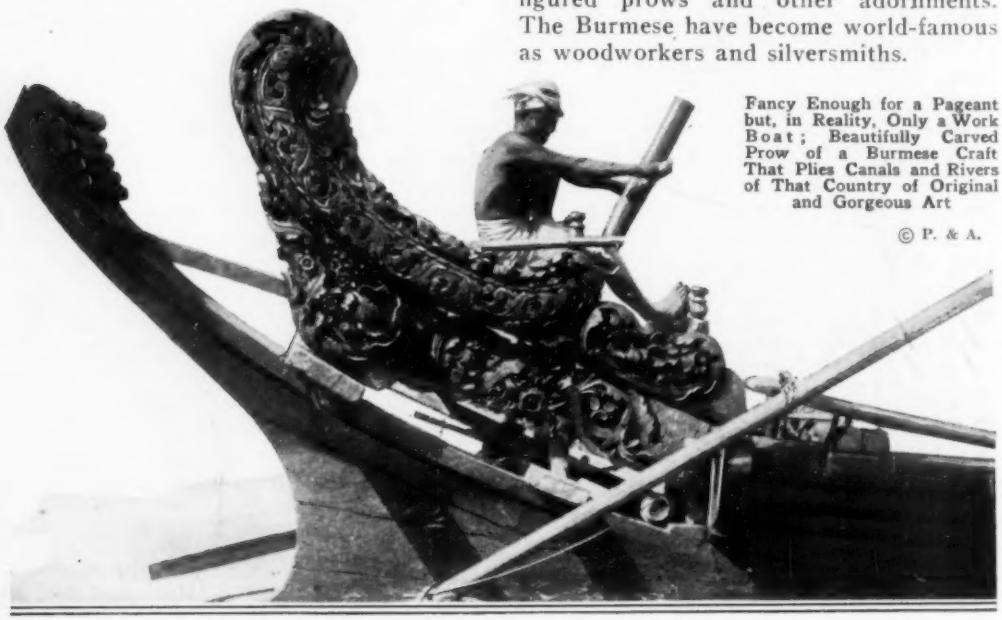
The authorization by congress of the two ships marks the progress in aviation since the "Shenandoah," with less than a third their capacity, was built. It had the slim lines of the earlier Zeppelins, while the new ships, like the "Los Angeles," will have greatly increased girth in proportion to length. The increase in girth gives greater strength, cutting down the extreme length which made it easy for a ship to break its back. Despite a capacity more than three times that of the earlier ship, the new craft will be but 100 feet longer, permitting them to be housed in the present Lakehurst hangar. Money to build a new helium-extraction plant has been asked for, to insure sufficient gas supplies by the time the ships go into commission.

MOST AUTO ACCIDENTS OCCUR IN EARLY EVENING

Between five and six o'clock in the evening is the most dangerous hour for motor-car driving, according to a survey of more than 1,000 accidents by the National Automobile chamber of commerce. Apparently, increasing fatigue during the latter part of the day is an important factor in the situation, for though some of the morning hours have a heavier traffic, the afternoon and evening hours generally show a larger percentage of accidents. While Saturdays and Sundays show the greatest number of fatalities, it is thought that these figures are likely to be misleading and that these days are really no worse than others with respect to accidents if the increased volume of traffic is taken into consideration. Sunday showed a fatality rate only twenty-three per cent greater than that of Monday.

CARVED PROW ON WORK BOAT SHOWS BURMESE SKILL

Carrying cargo in elegantly carved boats would be considered incongruous in this country, but it is done every day in Burma where wood-carving is one of the national arts. Many of the rice boats and other small craft have handsomely figured prows and other adornments. The Burmese have become world-famous as woodworkers and silversmiths.



Fancy Enough for a Pageant but, in Reality, Only a Work Boat; Beautifully Carved Prow of a Burmese Craft That Plies Canals and Rivers of That Country of Original and Gorgeous Art

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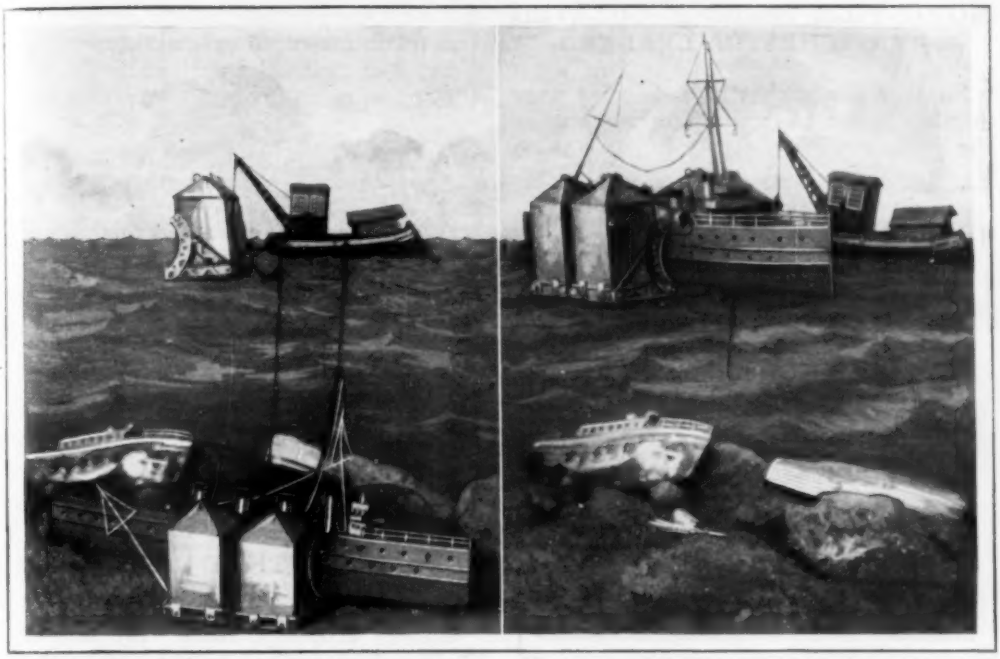


Models Illustrating How a Cuban Inventor Proposes to Raise Sunken Ships; a Feature of the Plan Is That the Pontoons Can Be Assembled in Groups According to the Size of the Craft

PONTOONS FOR RAISING SHIPS TESTED WITH MODELS

Ingenious pontoon models have been constructed by a Cuban inventor to demonstrate a system he has developed for raising sunken ships. In a test at Havana, one of the pontoons is said to have lifted twenty-five times its own weight. Among advantages claimed for the plan are the lightness of the tanks and the ease with which they can be grouped and fastened together by frames for tackling large or small vessels. As in other pontoon systems, use is made of compressed air to force the water out of the tanks after they have been submerged, to make them buoyant and so float the wreck, which is hoisted to the surface by means of hawsers passed underneath it.

LIGHTNING STRIKING A VESSEL THROWS IT OFF COURSE

Compasses were seriously affected on the motorship "Narragansett" not long ago when a bolt of lightning struck the vessel as it was cruising in the north Atlantic. The needles spun about rapidly, then settled down but with marked deviations. One indicated a westerly course, another an eastern, the difference being as much as twenty-three degrees. To meet the unusual situation and regain the proper course, the officers had a platform erected above the wheelhouse sufficiently high so that the magnetic influences induced in the house by the lightning would not be communicated to the instruments placed on the elevation.

WINDOW WASHER AND DRIER COMBINED IN ONE

Window panes are washed, dried and polished all with one simple instrument that has a rubber sponge on one side and a special squeegee on the other. It is not necessary to put the hands in water when using this tool, as it has a grip in the center for fastening a pole if needed.

¶In London, forty first-aid stations have been placed at busy traffic centers.

MOVIE-FILM SPEED REGULATED BY ORCHESTRA LEADER

So that the orchestra conductor may develop better effects, while interpreting the picture with a musical selection, a

Giving the Orchestra Conductor Control of the Motion-Picture Film's Speed; the New Regulator Box

German inventor has devised a speed control for the film, operated by the leader from the pit. With it, he can accelerate or retard the movement slightly, to accompany the music more realistically, without destroying the general effect to the spectators. In many theaters where the music is an important part of the program, the film is given a trial run before it is shown to the public and, at this test, the orchestra leader and assistants calculate the exact time of different passages.

FIND HUGE PETRIFIED FOREST IN TEXAS VALLEY

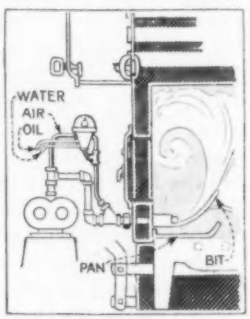
Nearly 100 miles from the nearest railroad, a petrified forest, said to surpass any previously known, has been discovered in an almost inaccessible valley of the Big Bend region of Texas. Few white persons have visited the locality, and the ground is covered with a thick layer of volcanic ashes and pumicestone, which partly hide some of the stone trunks and indicate that the forest is of great antiquity, for no volcanic disturbances have occurred in the region for hundreds of years. Some of the petrified trees, 100 to 150 feet high, were found standing, and one that had fallen measured several hundred feet. From a distance, the upright trunks have the appearance of natural-rock columns.

WATER SLAP BLACKS THE EYES OF RECORD HIGH DIVER

A new peril of extremely high diving was brought forcibly home recently to a young Italian immigrant who tried to commit suicide by diving off the Manhattan bridge in New York. With his body moving more than ninety feet a second at the end of the 142-foot drop, the slap of the water when he struck blackened both his eyes and sprained his wrist. After hitting the water he decided to live, so began to swim and was picked up by a tug.

OIL BURNER THAT USES WATER REDUCES HEATING COST

Greater economy, more heat and less likelihood of explosions are cited among the desirable features claimed for an oil burner that may be adapted to almost any size of furnace. Its distinguishing point is that it consumes a mixture of oil and water with the results suggested above, and the additional advantages that no carbon deposits are formed and odorous fumes are eliminated. The apparatus is arranged in such a way that the small particles of water become covered with a film of the oil while the hydrogen and oxygen in the water are liberated and provide an additional supply of elements for combustion besides the air. With this installation, it is said, special fire-box lining of brick or other materials is not necessary, and the burner can be throttled down to a small oil consumption so that heat may be maintained without waste of fuel.



Our Bureau of Information will answer all questions regarding articles appearing in this magazine.

Inspecting the Cables on the Incline Railroad up Mt. Lowe

GUARDING LIVES OF MILLIONS UP "STAIRWAY TO HEAVEN"

In the thirty-eight years that it has been in operation, the incline railway up Mt. Lowe, Calif., has taken millions of persons to the summit and, in all that time, there has not been one accident. The record is considered a noteworthy achievement in safety practice, since the "Stairway up to Heaven," as it is called, in places has a sixty-two per cent grade. The cars used are of a special type and are pulled to the top by an endless steel cable which is tested to a 100-ton capacity, but never loaded beyond a five-ton limit. The tracks rest on stringers framed to the ties to prevent creeping, and, as a further safeguard, each car is equipped with a larger stationary cable working through an automatic clutch to hold it in case of accident. The hoist is run by a 100-horsepower electric motor and elaborate safety controls are provided. The operator has before him a miniature model of the railway system, which shows him the exact position of the cars during the trips. The pulling cable is replaced every year and is inspected weekly. In this task, a skilled cable expert slides slowly down the center rail on a board car, applying the brakes with his feet so that he does not have to walk. He can reach the cables on both sides. Changing the huge line is an exacting task, as the speed of the machinery at the top of the incline must coincide exactly with that of the power reel taking in the old cable at the foot.

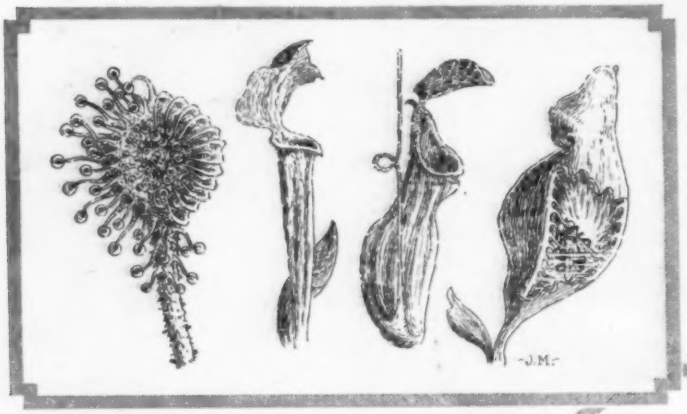
SANDER ON HEAVY AUTO TRUCK PREVENTS SLIPPING

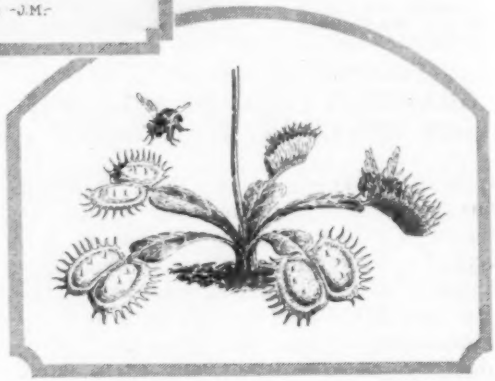
German truck designers have gone to the railroads for one of their latest attachments, a sander which distributes a supply of dry dust in front of the rear wheels to prevent skidding on slippery surfaces. The arrangement is similar to the sanding equipment on a railroad locomotive. The box holds a generous supply and is easily refilled.

Sand-Distributing Nozzle Is Seen in Center Directly in Front of Rear Motor-Truck Wheels

DEATH TRAPS OF PLANT WORLD WAR ON INSECTS

Of recent years, scientists have been visioning a world freed of its disease-carrying flies and mosquitoes, its gnats and crop-destroying bugs, and the thousands of other insects with which it is burdened. Curiously enough, it is to the plant world that they have turned for relief instead of to the inventions of man. For nature, compensating for every evil, has created plants which need only be developed in sufficient numbers to destroy the insects. These plants are found all over the globe, and the United States possesses quite a few different species. Down in North Carolina, for instance, is a remarkable plant that preys upon insects. It is called the Venus fly trap. Although it usually is found on waste lands, it is one of the most successful hunters of big game, in proportion to its size, in the world. Flies, worms, beetles and bugs of all descriptions are trapped by it, after which the plant proceeds to devour its catch. It consists of a reellike stalk, surmounted by a flower, and several broad-bladed leaves at whose tips are the traps. Each trap is in the form of two lobes set at slightly less than a right angle. Along the outer edge of each lobe, giving it the appearance of an inverted eyelash, is a row of small thorns. On the inside are three sensitive hairs which spring the trap at the slightest touch

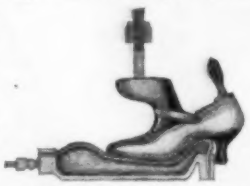




Drawings of the Sundew, Jack-in-the-Pulpit, Lady Slipper, Pitcher Plant and the Venus Fly Trap, Showing Their Honey-Filled Death Chambers and Dangerous Tentacles That Trap Unsuspecting Insects

SHOE SOLES GLUED ON INSTEAD OF SEWING OR NAILING

In rebuilding shoes, a process for gluing on the soles instead of sewing or nailing them has been developed with considerable success in foreign countries, and is said to be gaining in popularity here. The method involves the application of special adhesives and the aid of a powerful hydraulic press. One of the most effective presses provides a leather surface on which to set the shoe for gluing and when pressure is applied, the leather follows the contour of the old sole evenly, as the water insures even distribution of the force, and a perfectly fitting shoe is the result.



VANISHING SHOW CASES GUARD PRICELESS GEMS

Valued at $3,000,000, the great Regent diamond as well as many other precious jewels, is on display in a glass case at the Louvre, stared at by scores of visitors daily and apparently in a favorable position for anyone intending theft. But robbers, bent on pilfering the gem collec-

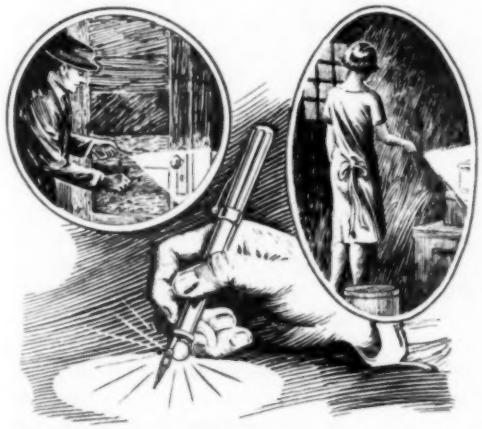
tion, would meet a surprise should they enter the room at night, for it would be empty save for busts and vases weighing as much as a burglar-proof safe. The jewel cabinets are so arranged that they disappear into skillfully concealed vaults beneath the floor, and the apparatus which lifts and lowers the platforms is also hidden and so complicated that only authorized attendants, who know the secret, could possibly operate it.

CLOVER THAT PLANTS ITSELF TO AID FARMERS

Government plant testers see considerable savings of time and expense for farmers in two kinds of self-perpetuating clover, which have been under observation at the experiment station near Washington, D. C. On one, the stems bend down and scratch the surface of the ground shortly after the pods have formed, so that the seeds are deposited under favorable growing conditions, unless the soil is too hard. The other kind perpetuates itself even after it has been mowed to within an inch of the ground.

PENCIL AND FLASHLIGHT IN ONE HAS MANY USES

Resembling a fountain pen in appearance, a pencil has a small bulb lighted by a battery inside the holder. It is specially adapted to use in a sick room and, as a light alone, is always ready.



Drawings Showing the Pencil and Its Light, and Typical Uses

YEARLY SOOT FALL IN LONDON SIX TONS TO SQUARE MILE

Soot Meter in Operation; Removing Bottle of Dirty Water for Analysis of Contents

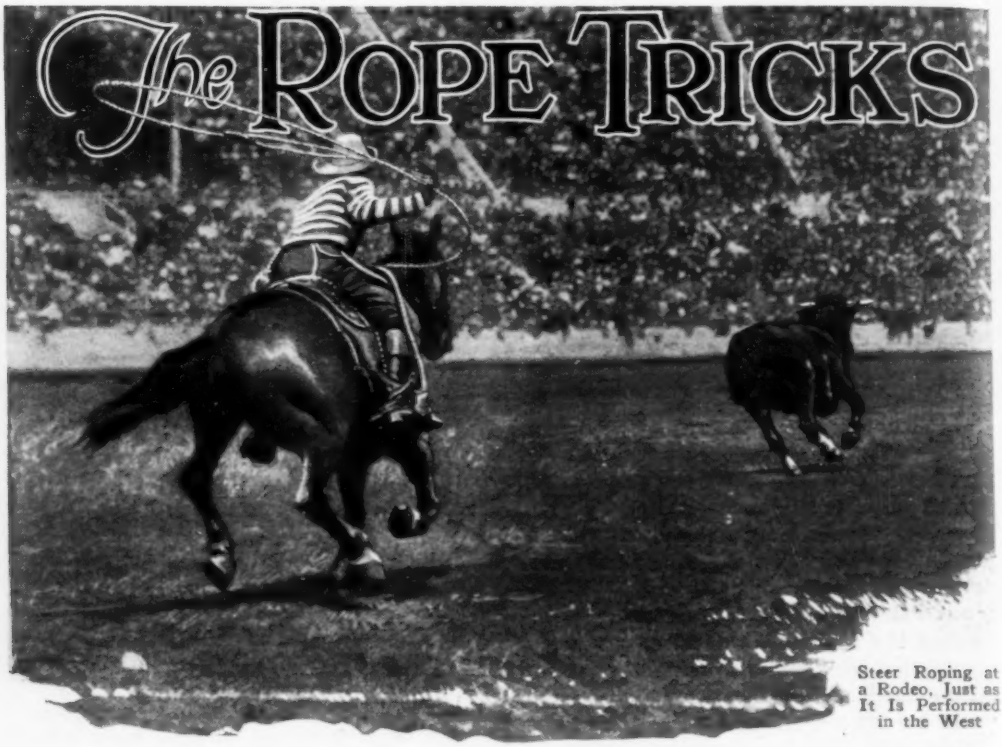
From measurements made with an interesting gauge at a London weather office, experts estimate that about six tons of soot fall on every square mile of the city's area in a year. The gauge consists chiefly of a funnel arrangement through which rain water falls and is collected into bottles. Once a month, the content of the bottles is subjected to a chemical analysis and from this examination, the total amount of soot is computed.

LIZARD LIKE BEARDED DRAGON FOUND IN AUSTRALIA

There are some 1,700 species of lizards and many of them are found in Australia. One, native to that country, is known as the bearded dragon or Jew lizard, and still another is remarkable for the frill about its neck. This lies flat when the creature is not disturbed, but when the animal is attacked or frightened, it is raised like a shield about the head.

¶About 220 hours of man-power are required to build a low-priced automobile today.

The ROPE TRICKS



Steer Roping at a Rodeo, Just as It Is Performed in the West

By BOB BECKER

TRICK roping, a comparatively new sport, is another example of the influence of the west with its cowboys, broncho busters and "lassoers." Ever since the days of Buffalo Bill's wild-west show, boys have tried their hands at throwing a "lasso." Now, with the rodeo or cowboy contests gaining in popularity in all parts of the United States, the youngsters are learning how to handle a small lariat, not for lassoing but to do tricks with it. The trick roper needs a small rope or lariat and that's all.

Hundreds of tricks can be done with a rope, and the object of the sport is to beat the other roper in ease, gracefulness and number of stunts with a spinning loop. Cuba Crutchfield, one of the greatest ropers of the west and instructor in the art for several thousand boys, advises every youngster wishing to learn to handle a lariat to start with not more than sixteen feet of rope. A boy, twelve to sixteen years of age and of average build and height, can usually handle that much rope without trouble. Half to quarter-inch, closely braided cotton rope is desirable, as a soft strain with no backbone is difficult to spin. So great has been the demand for rope suitable for boys' use that in many large cities the youngster is able to purchase for a reasonable sum a fifteen or sixteen-foot length with a hondo already inserted in it. A hondo (or ring) is a small oval or round piece of metal looking much like a contrivance made to cut holes in a doughnut. It furnishes an opening of constant size through which the rope is threaded so that a loop may be formed. For trick roping, a metal hondo (the word is Spanish) is needed as it gives weight to the loop and the few ounces thus added make it much easier to handle.

This ring, grooved so that one end of the rope can be curved around it to fit snugly, is held in place by a piece of wire which is run through the end of the lariat and then into the rope. When the wire has been wrapped around these pieces of the lariat, they should be taped until all the wire is covered. The other

of the WILD WEST

Cuba Crutchfield, Champion Fancy Roper, and One of His School-Boy Pupils, of Whom He Has Trained Many Thousands Each Summer

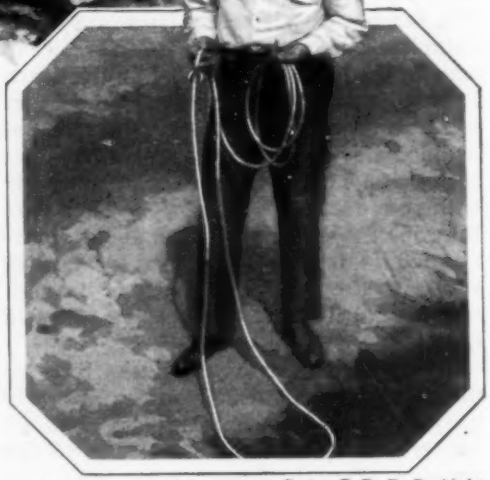
end of the rope also should be wired, in order to prevent it from raveling, and two or three turns of tape passed around it to cover the wire loops.

Learning how to spin a rope is comparatively easy if one starts right and masters a few simple rules. This is merely a matter of practice. Here are Cuba Crutchfield's instructions to boys (and adults, too!) who would like to learn to spin a loop. He says: "A beginner must know how to assume a correct position if he would learn any tricks. Here is position number one: Stand naturally with your feet spread slightly. Then take the rope in your right hand, about eighteen inches back of the ring, or hondo, and, with the left, 'feed' the rope through the ring until about two-thirds of it is in the loop.

"When this is done, turn the loop so that it is spread out in front and slightly to your right, the metal ring eighteen inches from your hand. Now, as to the position of your fingers, your first two should hold the loop while the last two of your right hand should grasp that part of the rope not included in the loop. In this way you keep the loop separated from the feeder part. Your left hand is used in much the same way before you start the spin. Your first and second fingers hold the loop while the third and fourth are around the feeder rope, just about halfway between the hondo and the end of the lariat.

"To start spinning the loop requires a quick flip which finishes with a wide, sweeping circular motion of the right hand, so that the loop will start its round-and-round course. When you start the loop spinning, the palm of your right hand is facing out and the loop is to your right. With a movement of your wrist you turn the loop over and at the same time lean over and with your whole arm make a wide sweep toward your body. As you make this turn, release the circle with your left hand and hold the end of the rope in your right hand."

It takes more than one try to get the rope whirling in a perfect circle, but once going, it is not difficult to keep it spinning. And this is the first elemental stunt



in all trick roping—learning how to spin it in front of you. The next trick to learn is that of jumping in and out of the loop, as the ability to do this is the basis of dozens of tricks. With the loop whirling one must be able to skip into it with a quick jump and then keep the circle going about the body.

Mr. Crutchfield advises beginners to make changing hands around the body their third trick. Standing in the middle of a spinning circle, the idea is to pass the end of the rope from one hand to the other around the body, meantime keeping the loop going. Boys who enter the trick-roping contests conducted on the playgrounds of large cities are required to master this trick before being eligible to the finals of the contests.

They are also required to learn the "juggling the loop" trick. This is a spectacular piece of rope handling which shows how one can, through practice, become complete master of a six-foot loop. Starting with a circle close to the ground, the roper gives his loop a powerful upward thrust, which sends the spinning loop above his head so rapidly that the eye can hardly follow it. When it comes down close to the ground, he shoots it skyward again until the loop is soon going up and down alternately at lightning speed.

Next, the trick of "skipping the spoke" requires quick thinking and quick action. In this trick, the roper stands in the center of a spinning loop and jumps over the spoke, or that part of the rope coming from the loop to the hand, as it goes around at great speed. Another trick is that of handling two small loops at the same time.

The motto "practice makes perfect" is graphically illustrated in trick roping. Although boys (or adults) may learn a

Center © R. R. Doubleday

A Lover's Knot, Center; and, Top and Bottom, Cuba Crutchfield Showing How the Lariat Is Held in Doing Fancy Spinning

A Few of the Fancy Tricks Crutchfield Teaches His School-Boy Classes; in Photo at Right End of Center Row, the Hands and Feet Alternately Lift, to Clear the Rope as It Revolves

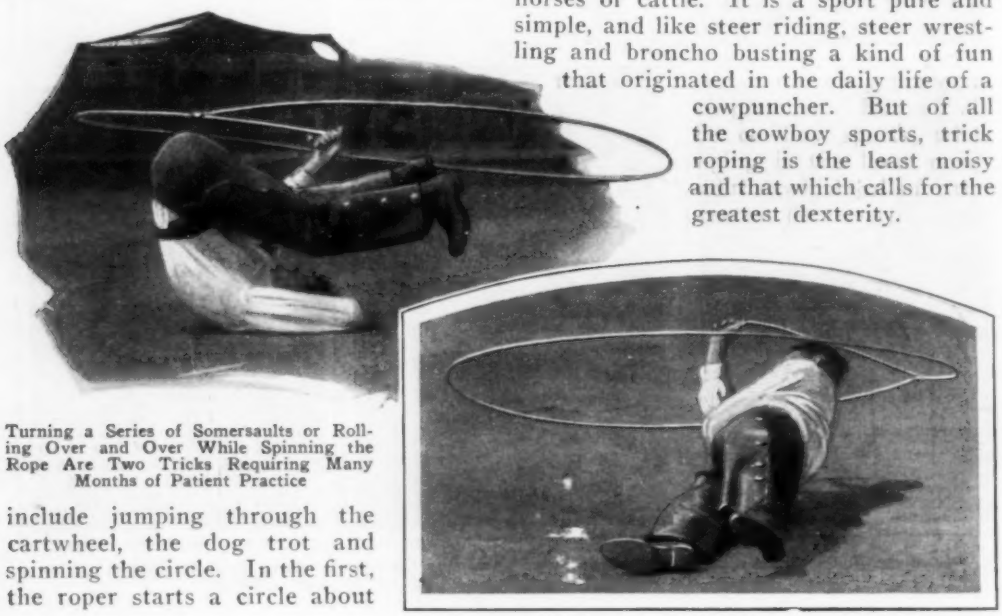
number of interesting tricks in a comparatively short time, the professional trick ropers of the west point out that they have been working at this sport for years, trying to originate new tricks and perfect old ones. Crutchfield, a true westerner born in the cattle country of Texas, says that he has been doing trick roping for twenty-four years. Other famous cowboy ropers, like Chester Byers, holder of the world's championship trick and fancy roping title; Bob Calen, Tommie Kirnan, and Johnnie Rufus also testify to the fact that it takes years to learn some of the flashy, spectacular tricks which they perform in rodeo contests, doing them both on foot and on horseback.

Crutchfield originated the roll and somersault tricks, two of the most difficult stunts that a roper (on foot) can attempt. In the first, he rolls over and over on the ground while keeping a loop spinning above him. In the second he starts a whirling loop, crouches and then turns a somersault, meantime keeping the big loop whirling without a waver. He makes two or three backward or forward somersaults in succession which shows complete mastery of the rope and combines acrobatics with rope spinning.

Other difficult and interesting tricks which professional ropers are able to do, include jumping through the cartwheel, the dog trot and spinning the circle. In the first, the roper starts a circle about six feet in diameter in front of him. Then he gives it a sharp pull toward his body which brings the loop toward him. At the correct moment he jumps through it and then brings it back again for another jump. In spinning the circle, the roper keeps one foot out of the loop and the other in and then passes the loop under his foot. It takes many a quick skip and jump to do this trick.

Although roping tricks done while the roper is on the ground are interesting and as difficult as any devised, because they involve acrobatics, trick roping from a horse is more spectacular. Here is where the professional ropers are in their element. They spin loops around their horses, throw circles at galloping riders, catch horses by one foot, four feet or around the head and even toss a circle large enough to take in two or three riders. These tricks represent the last word in dexterity, quick thinking, and timing, as several ropers are able to throw a big loop backward at a galloping horse at just the right second to catch either fore or hind feet.

Although a healthful outdoor pastime which aids muscular development and thus is of benefit to boys who aspire to master this new type of western sport, trick roping is of practically no value to the cowhand in his everyday tasks with horses or cattle. It is a sport pure and simple, and like steer riding, steer wrestling and broncho busting a kind of fun that originated in the daily life of a cowpuncher. But of all the cowboy sports, trick roping is the least noisy and that which calls for the greatest dexterity.



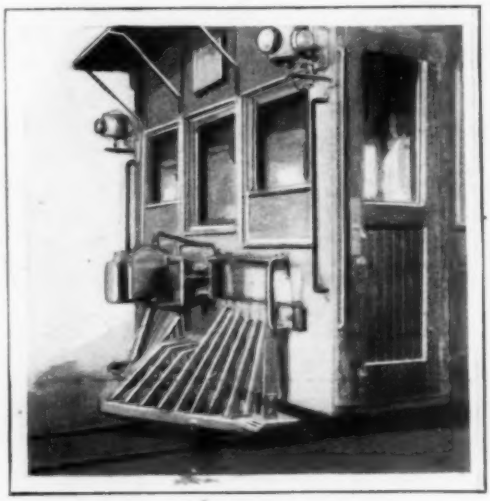
Turning a Series of Somersaults or Rolling Over and Over While Spinning the Rope Are Two Tricks Requiring Many Months of Patient Practice

BLINDS PROTECT HOUSES FROM STORM DAMAGE

Outside window blinds are not extensively used these days except for decoration, but their efficiency in protecting houses and other structures from storm damage has been so convincingly demonstrated that builders are wondering if a mistake has not been made in discarding them. In Cuba, where hurricanes are not uncommon, all buildings are fitted with shutters, and although the Florida storm last year damaged hotels that did have blinds, the havoc was much less than it would have been had there been no protection for the windows, it is believed. If a wind of sufficient strength blows in the glass, a pocket is formed in the interior of the building, giving the storm additional opportunity to cause destruction. By preventing this, the shutter decreases damage.

OBSERVATION BOOTH IS BUILT IN FRONT OF LOCOMOTIVE

For track and tunnel inspection on a western railroad, an engine has been equipped with a glass observation cage in front so that observers may ride close to the rails and obtain an unobstructed view of the entire right of way. The controls are in the cage, so that the engineer may ride with the inspectors and stop the locomotive without the need of signaling. The fireman occupies his usual post in the cab. There is room for several men on the long upholstered seat that extends across the compartment.



Enabling Inspectors to Gain a Close View of the Track; the Observation Booth on Locomotive

These Scales Are So Nicely Balanced That They Register the Weight of the Sweat on a Man's Brow

SCALES THAT "WEIGH EMOTION" AID MINING TESTS

Investigators of the bureau of mines and of the Pittsburgh experiment station have been conducting a number of interesting tests recently to determine the effects of weather and temperature conditions on workers. In connection with the research, scales so delicate that they could weigh the sweat on a miner's brow to indicate how energy had been expended under certain conditions, were used and so accurately adjusted that it was considered fair to say that they could "weigh emotions," since any difference in weight due to nervous excitement or other moods, was recorded. One of the principal uses of the scales was in relation to the amount of heat and moisture that will be thrown off on the average by a large audience assembled in a theater or other public building. These data are considered of great importance to heating and ventilating engineers as well as to health officials.

CAMERA TAKES FIFTY PICTURES ON SINGLE ROLL OF FILM

Illustrating the Size and Operation of the Fifty-Exposure Camera

Weighing only twelve ounces including the film, a small camera now on the market takes fifty pictures on one roll and is so simple to operate and load that it offers distinct advantages to the tourist or other person who wishes to make a pictorial record of a journey at little expense. The camera is approximately two by two and one-half by four inches in size, has a rapid lens and is equipped with a full range of speeds and stops. The negatives, slightly less than an inch square, occupy a roll about the length of a six-exposure film for a camera of post-card size.

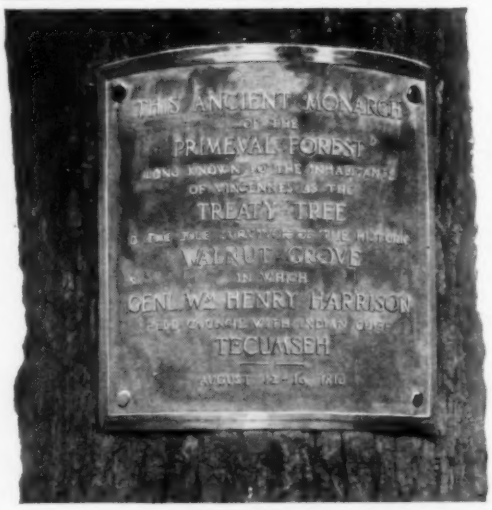
They may be printed in sections, that is, several developed on one sheet of paper and then cut apart if desired; can be enlarged to three and one-quarter by four and one-quarter size in a handy enlarging device or be printed on positive motion-picture film for showing on a screen through a special projector made for this purpose. The film thus replaces glass slides for "still" views. In operation, a small dial on the front of the camera keeps track of the number of exposures made. The winding is done by means of a lever on the back.

STRAWBERRY GROWN ON TREES TO AID COMPLEXION

Among a number of strange fruits recently brought to this country was a giant strawberry which is said to have properties tending to reduce the weight and improve the complexion of persons who eat it. The berry is found in China, along the coast south of the Yangtze river. It grows on trees, has beautiful flowers, and bears half a dozen crops a year. Efforts will be made to develop it for cultivation in this country.

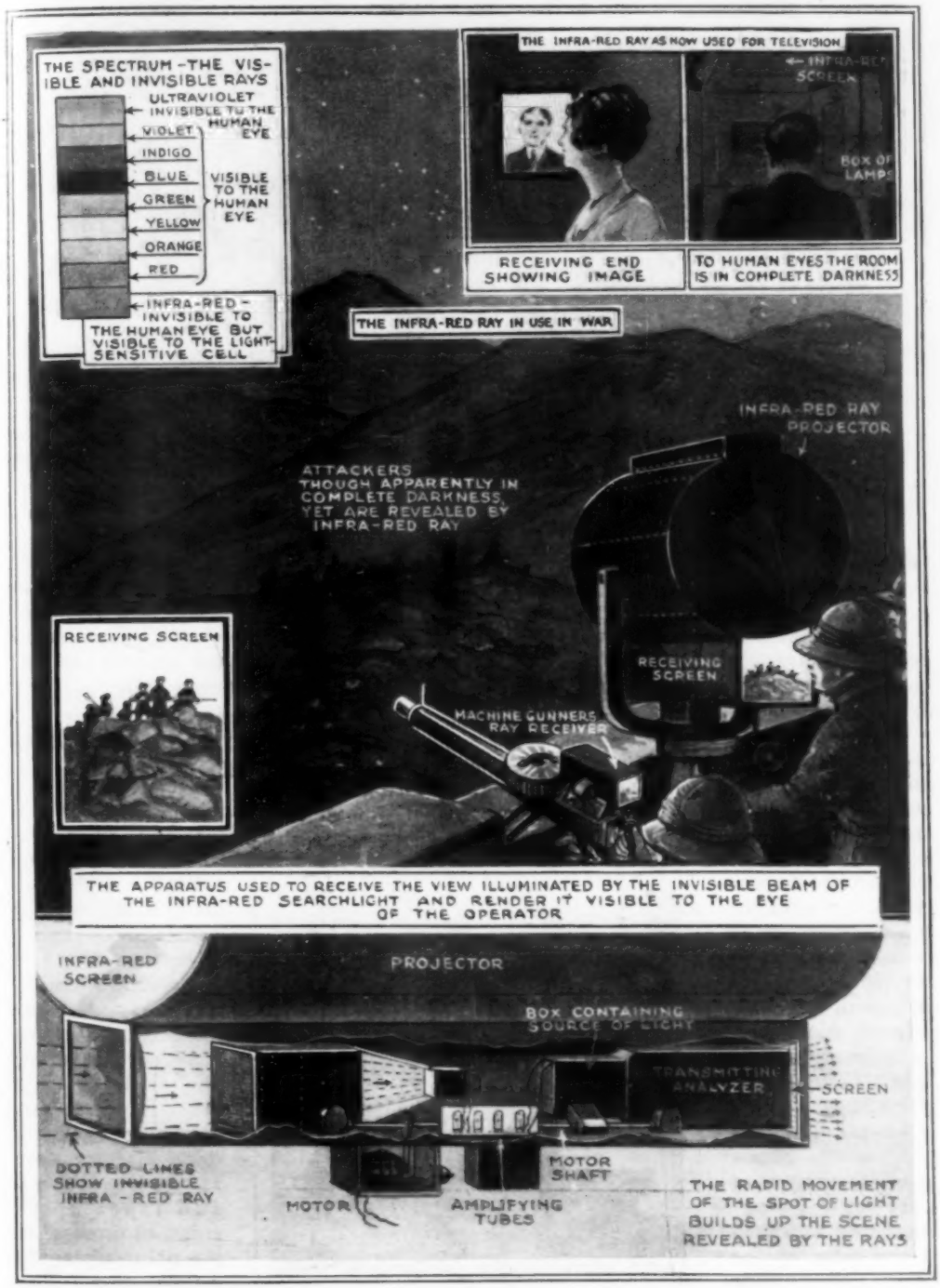
MEMORIAL TREE MARKS SCENE OF FAMOUS INDIAN TREATY

Preparations already are being made for celebrating the 150th anniversary of the defeat of the British near Vincennes, Ind., by George Rogers Clark, a victory which contributed largely to the saving of the great middle west to the United States. The plan is to have a weekly observance of the occasion throughout the year 1929. A memorial building is proposed, with murals showing scenes of Clark's victory, and the structure later is to be converted into a national shrine. The anniversary will also recall the treaty between Tecumseh, famous Indian chief, and President William Henry Harrison, by which peace was made between the whites and Indians. A memorial tablet has been placed on a tree which stands near the spot where the treaty was made in August, 1810.



Marking an Important Spot in American History; the Treaty-Tree Tablet Recalling Chief Tecumseh

SEEING IN THE DARK BY MEANS OF "BLACK LIGHT"


THE SPECTRUM—THE VISIBLE AND INVISIBLE RAYS
ULTRAVIOLET
INVISIBLE TO THE HUMAN EYE
VIOLET
INDIGO
BLUE
GREEN
YELLOW
ORANGE
RED
VISIBLE TO THE HUMAN EYE
INFRA-RED — INVISIBLE TO THE HUMAN EYE BUT VISIBLE TO THE LIGHT-SENSITIVE CELL
THE INFRA-RED RAY AS NOW USED FOR TELEVISION
INFRA-RED SCREEN
BOX OF LAMPS
RECEIVING END SHOWING IMAGE
TO HUMAN EYES THE ROOM IS IN COMPLETE DARKNESS
THE INFRA-RED RAY IN USE IN WAR
INFRA-RED RAY PROJECTOR
ATTACKERS THOUGH APPARENTLY IN COMPLETE DARKNESS, YET ARE REVEALED BY INFRA-RED RAY
RECEIVING SCREEN
RECEIVING SCREEN
MACHINE GUNNERS RAY RECEIVER
THE APPARATUS USED TO RECEIVE THE VIEW ILLUMINATED BY THE INVISIBLE BEAM OF THE INFRA-RED SEARCHLIGHT AND RENDER IT VISIBLE TO THE EYE OF THE OPERATOR
INFRA-RED SCREEN
PROJECTOR
BOX CONTAINING SOURCE OF LIGHT
TRANSMITTING ANALYZER
SCREEN
DOTTED LINES SHOW INVISIBLE INFRA-RED RAY
MOTOR
AMPLIFYING TUBES
MOTOR SHAFT
THE RAPID MOVEMENT OF THE SPOT OF LIGHT BUILDS UP THE SCENE REVEALED BY THE RAYS

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Using Invisible Infra-Red Rays and a Fluoroscope as a Receiving Screen, an English Inventor of Television Apparatus Has Developed an Invisible Searchlight for War Use

Domestic-Science Class in Traveling Auto Bus; Interior of the Well-Equipped Car for Giving Instruction in Latest Home Practices to Rural Communities

AUTO BUS FITTED AS SCHOOL FOR DOMESTIC SCIENCE

To help spread the doctrine of better health, homes and cooking, a lighting company maintains an auto bus equipped as a school and demonstration room with a capacity of thirty-seven "pupils." With specially trained experts and lecturers in attendance, the traveling "college" visits cities, towns and villages in an area of more than 400 square miles, where housewives can see tests with the latest kinds of cooking equipment, listen to talks on preparing special foods, on buying and other pointers in domestic management. Special attention is given the question of proper illumination for the home, even to matters of correct wiring. Seats are arranged at the sides of the bus, leaving a wide center aisle. A sink with running water, stove, table, cupboards and space for gas and electrical appliances are features of the equipment. Comfort and safety of visitors are assured by special means for ventilation and an extra door at the rear of the bus for emergency exit.

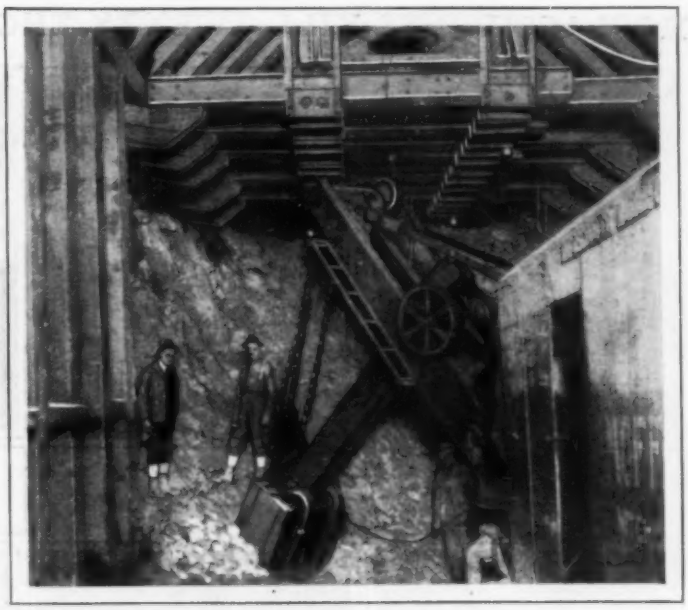
Built with Thick Walls to Defy Tornadoes; Steep Roof Is Intended to Let Winds Slide Off

CHURCH TO RESIST HURRICANES HAS STEEP ROOF

After a severe wind had destroyed a church building in Maryland, extra precautions were taken with the new structure, to make it as nearly proof against a repetition of the disaster as possible. It is low and has an extremely steep roof, so that winds can sweep over it without encountering much resistance. The walls are three feet thick and taper up to eighteen inches at the point where the rafters rest. The force of winds is also broken by trees.

MELTING BULLET MADE TO AID CRIME WAR

Composed of glycerin, stearin and an antiseptic compound, a "deathless" bullet, devised by an eastern inventor, is intended to wound a person without killing him. It melts after entering the body, leaving a clean wound, but has force enough to stop a man at twenty feet, and would be fatal if striking a vital spot. A feature of the bullet is that it makes twice as much noise as an ordinary one when fired, so it would be of aid to a citizen in spreading an alarm. Tests showed that it penetrated a one-inch pine board, and it was also shot into a ham to demonstrate its properties.



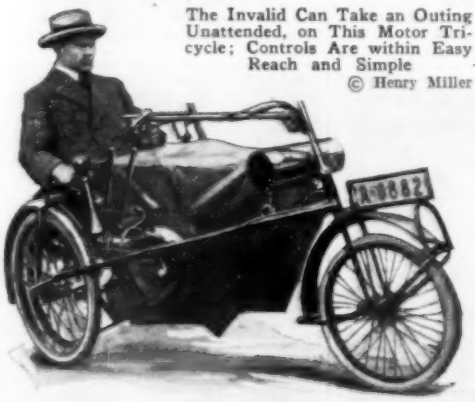
How the Steel "Rib" Holds Up Mountain While Men Pierce Continent's Backbone; Scene in Moffat Tunnel

STEEL RIB FOR USE IN TUNNEL PREVENTS CAVE-INS

Engineers estimate that more than $2,500,000 will have been saved in labor costs and, doubtless, several lives spared in digging the Moffat tunnel in Colorado, through the use of a huge steel cantilever girder for supporting the top of the passage while timbers are put in place. Three of the girders have been used. Each is sixty-five feet long, ten feet high, eighteen feet wide, and weighs fifty tons. The girder is built of structural steel and somewhat resembles a centipede lying on its back. It has projecting arms which support the arched section of the tunnel roof, while drilling, blasting and timbering of the bench on which it rests are in progress, and, as the work proceeds, it is advanced on a track by means of chains and cables attached to an air hoist. The apparatus is also used to place the enormous timbers which hold up the roof, a task that usually calls for many men and is often attended with disastrous slides. The girder was devised by George Lewis, general manager of the construction work on the tunnel and a mining engineer of many years' experience.

MOTOR CHAIR FOR INVALIDS IS EASILY CONTROLLED

For invalids and cripples, a wheeled chair containing an easily operated motor has been introduced in Germany. It



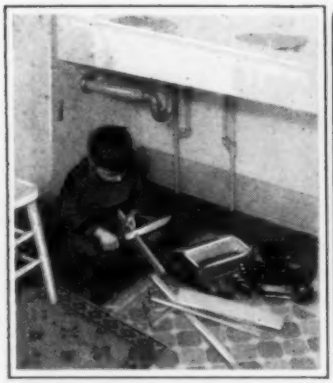
The Invalid Can Take an Outing Unattended, on This Motor Tricycle; Controls Are within Easy Reach and Simple

© Henry Miller

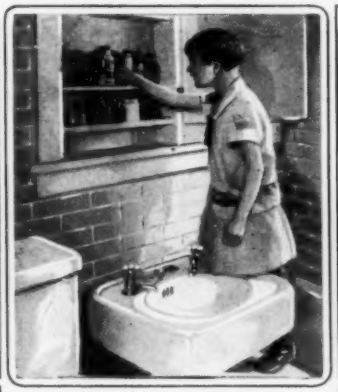
is simple to steer and has been designed with special emphasis on safety.

¶Regions with the most intense sunlight produce the most highly colored fruits.

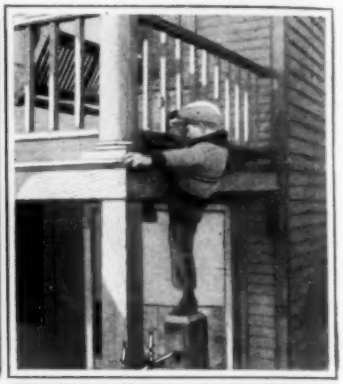
HOW ACCIDENTS KILL TWENTY THOUSAND IN YEAR



Common Acts That Result in Hurts and Deaths; Youthful Craftsman Courting Cuts

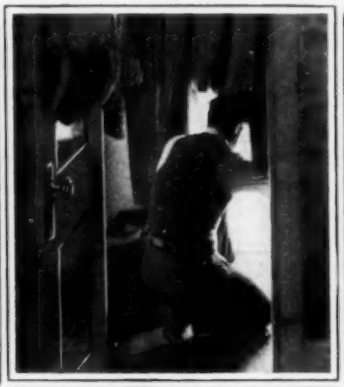


Inviting a Serious Fall by Standing on Edge of Tub, an Everyday Mistake



It's Fun to Climb, but What if the Porch Rail Happened to Break?

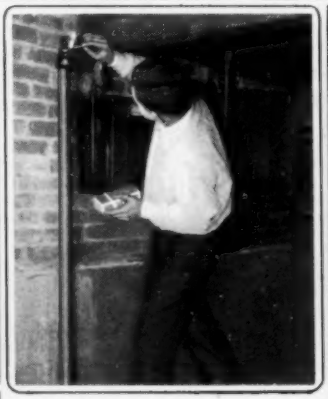
Flirting with Serious Injury or Death by the Use of Oil to Start Fire



Lighting a Match in Clothes Closet, a Common Cause of Costly Blazes

Flatiron Cord Is Ragged and the Inquisitive Child Is Inviting a Tragedy

Both Right and Wrong; Keep Matches off Stove and Have Gas Oven Open in Lighting



Looking for Gas Leaks with a Match and Pretty Sure to Find Serious Trouble

Appears Safe but It Isn't; Never Use Rocking-Chair as a Stepladder

© National Safety Council

POCKET RADIO SET AID FOR POLICE IN CRIME WAR

Tests with miniature radio-receiving sets by police in an eastern city have been so successful that it is planned to equip the force with the instruments to aid in the war against crime. The set can be carried in a box no larger than a cigaret case and consists of a single vacuum tube, small batteries, collapsible ear phones and an aerial attached to the policeman's sleeve or the lapel of his coat. On the outside of his uniform, there is a tiny electric light, suitably mounted, which flashes a signal from the central station telling him to listen in. The sets are effective over a range of three and one-half miles, according to the inventor, and operate on a wavelength of fifteen meters, too short to interfere with reception by ordinary household wireless. In case of a holdup or other crime, a general alarm spread from the main station would notify every policeman on duty within a few minutes to be on the watch for the fugitives. The news would be broadcast by voice, saving the trouble of learning a code.

Karl Illava Completing the Clay Model for the War Memorial; He Is Placing a Gun in the Hands of the Charging Figure

WORLD-WAR MEMORIAL COST HUNDRED THOUSAND

Notable because of the realistic facial expressions of the figures represented, a World-War memorial, erected in New York, cost $100,000 and took over two years to complete. It shows soldiers in heroic size, as though in action, fighting, charging and suffering the pain of wounds.

NINETY-FIVE-POUND TOPAZ WORTH THOUSANDS

One of the largest single pieces of topaz in the world has been added to the Smithsonian Institution collection from Brazil. It weighs ninety-five pounds or nearly 250,000 international metric carats, and is valued at approximately $3,000 in the rough. Another large topaz is in the Field museum of natural history. It weighs in the neighborhood of 100 pounds.

Huge Jewel from Brazil for the Smithsonian Institution; the Ninety-Five-Pound Topaz

FORTY-TON BANK-VAULT DOOR HAS TWENTY BOLTS

More than forty-five inches thick and secured by twenty steel locking bolts, five inches in diameter, the circular door of a bank vault in a Pennsylvania city is made doubly secure against theft as it is water-tight when closed, preventing the introduction of liquid explosives. The door weighs 80,000 pounds, is more than eight feet in diameter at the front, and is so nicely balanced that it can easily be swung by hand.

Bridge Game Designed to Be Played with Radio Instructors; the Movable and Washable Tabs Can Be Hidden from Opponents' View, Placed on the Board for Dummy, or Turned Down for Tricks Taken

BRIDGE GAME LETS RADIO FANS PLAY LESSONS IN ADVANCE

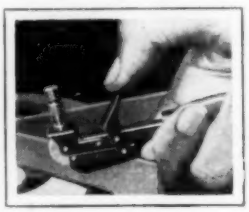
A bridge game by which radio fans who tune in on the broadcast card lessons, or others who are studying bridge from books, may set up any problem hand and play it over until all its possibilities have been mastered, is one of the newest things in card instruction. The game consists of four boards, one for each player at a full table, or they may be used separately for individual practice. The "cards" are merely "pips" showing the suit and number, and are made of washable celluloid, so they can be used indefinitely. They are held in small leather tabs, from which they can be removed whenever a new hand is set up. The tabs are attached to a long wire rod, enabling the cards to be set up on edge, so that other players cannot see them, laid flat, face up, for the dummy, or turned over, face down, when a trick is taken. A long strip of paper, held down by clips, is ruled so that the sequence in which each card is played can be jotted down, while the strip is wide enough to record five games, giving a permanent record, for comparison, of how each card was played in each game. Radio fans can take the bridge problems announced in advance, play them several times and record their play, and then save the slips for reference when the same hand is played and broadcast by the bridge expert, comparing the expert's play with the previous trials, and study the mistakes that may have been made.

INSIDE OF ROPE WEARS MOST

Lubricating ropes to keep them in good condition has been found helpful, since the wear and strain is frequently on the interior, where the twisted fibers cross each other, rub together and are likely to break. Tallow, lard and boiled linseed oil are widely used in treating the fibers to reduce friction. One of the standards for judging rope is the length of its fibers, long and strong ones characterizing the better qualities.

FLINT GUN FOR LIGHTING GAS REPLACES MATCHES

A modern development of the old system of starting a fire with flints is seen in a household lighter now popular in France.



It is essentially a small spark gun using a flint to ignite gas jets or to kindle a blaze. One flint is said to be equivalent to 600 matches and several are furnished with each lighter. The apparatus eliminates the fire risk from careless throwing away of glowing matches.

CHEWING GUM FOR AIR PILOTS HELPS IN DESCENTS

Gum chewing is recommended for pilots by the Royal Air Force flying-training manual, published in England, as it provides saliva and helps overcome the difficulty experienced in swallowing during descents as a result of parched throats. Swallowing aids in equalizing the air pressure within the ears when descending from a high altitude as it opens the narrow passages leading from the back of the throat to the inner side of the eardrum. In sudden downward flights, authorities recommend "clicking the ears," which means pinching the nostrils and forcing air from the chest into the nose until a clicking sound is heard in both ears. The manual also warns against excessive smoking that may lead to throat congestion, and suggests proper care of the teeth as another item of hygiene to which special attention should be devoted.

COOK MODELS HOTEL IN GLASS FROM OLD ELECTRIC LIGHTS

Glass used to support the filaments in old electric-light bulbs is the principal material a pastry cook has employed to fashion a realistic model of a thirteen-story hotel

Glass from Discarded Electric-Light Bulbs Was the Principal Material Used in This Model of Hotel

in Cleveland, Ohio. The pieces are fastened together with glue and the replica has glass floors, a tiny piano that plays, chandeliers, figures of dancing couples and other lifelike features.

Sketch Showing How Light from Street Lamp Shines through the Transparent Stop Sign

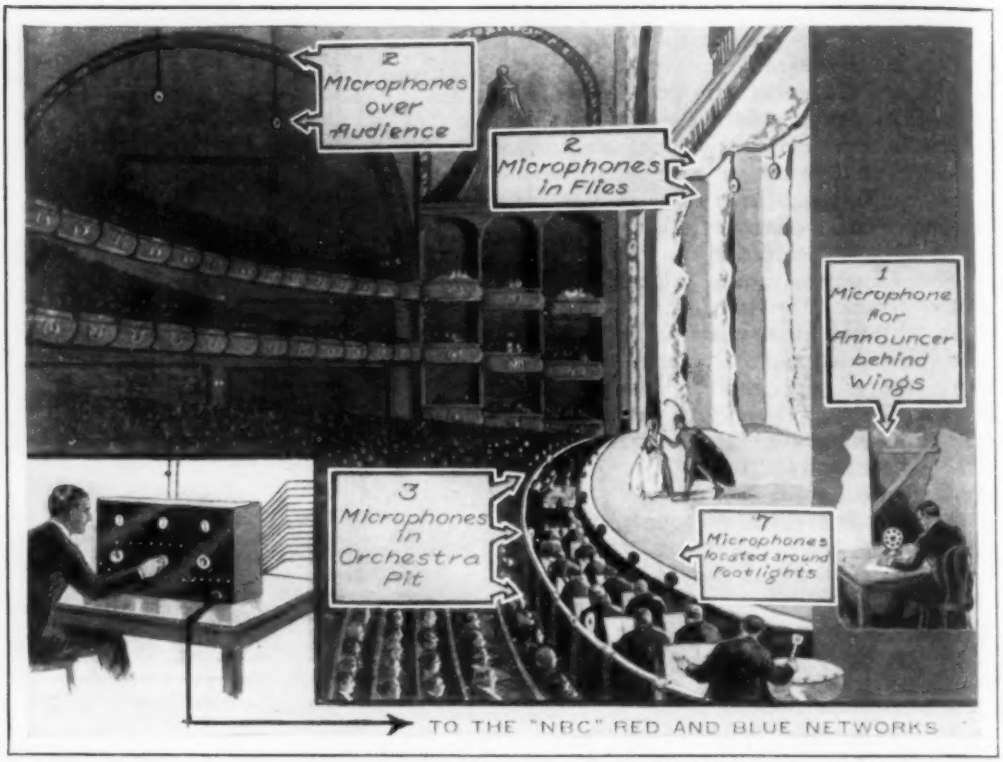
TRANSPARENT AUTO STOP SIGNS LIGHTED BY STREET LAMPS

Fitted with lenses on the rear side, a type of traffic sign now on the market, is distinctly lighted at night by the rays from the street lamps, so that it requires no batteries or wiring. The signals are durably constructed of steel, with legends in raised lettering against a yellow background. In installing them, it is only necessary to see that they are placed in relation to the street lights so that the lenses will receive full illumination.

FIX CENTER OF NORTH AMERICA NEAR DEVIL'S LAKE, N. D.

Recent surveys place the geographic center of the North American continent a few miles west of Devil's Lake, N. D. The spot is at forty-eight degrees ten minutes north latitude and 100 degrees ten minutes west longitude. Since the lake is close to the center, it becomes a natural monument, and, already a noted scenic place, gains additional distinction.

HOW GRAND OPERA IS BROADCAST FROM STAGE


2 Microphones over Audience
2 Microphones in Flies
1 Microphone for Announcer behind Wings
3 Microphones in Orchestra Pit
7 Microphones located around Footlights
TO THE "NBC" RED AND BLUE NETWORKS

Courtesy Chicago Evening Post

Drawing Illustrating How the Microphones Were Arranged on the Stage and in the Auditorium Theater for Broadcasting an Act from the Opera "Faust"

Successful broadcasting of the second act of the opera "Faust" from the Auditorium theater in Chicago was accomplished by distributing fifteen microphones about the stage, orchestra pit and over the audience, and employing a mixing panel to blend and subdue the tones. The result was pronounced one of the most satisfactory ever achieved in radio transmission of so complex a program—voices, and a large orchestra requiring careful handling in order that the effect might not be spoiled for the radio listener by too much volume from any one set of instruments or by the solo vocal parts being indistinct. For several days before the performance, engineers were busy installing the equipment.

RED DIAMONDS MOST VALUABLE BLUE ONES NEXT

Instead of being colorless crystals as is popularly supposed, diamonds are found in a great variety of colors and are priced according to their hue as well as their size and freedom from imperfection. Red diamonds are rarest. A small one, found at Kimberley recently, was valued at $4,500 in the rough. The blue stones are considered next in point of worth, and the pure grass-green gems third, while yellow diamonds are as cheap as the red are dear. There are brown diamonds of comparatively no value. One of the most costly diamonds is the ten-carat stone purchased by the Emperor Paul of Russia at a price of $100,000. Orange diamonds are rare and bring large sums. The value of pearls is also based largely on color, the most highly prized being the black ones and next, the pink. One of the largest of this color was taken from

a fresh-water mussel in a tributary to the Mississippi river. It is three-quarters of an inch long and valued at $40,000. As with diamonds, the yellow pearls are the least valuable. Rubies, sapphires and the topaz are sometimes improved in color by treating them with radium which seems to burn out their impurities.

TURN SAWDUST INTO CHARCOAL TO FEED CHICKENS

Charcoal, suitable for feeding to chickens, is being produced by an improved process in the state of Washington by charring sawdust in a rotating retort. It is said that the method is far faster than older processes and, since use is made of material that otherwise would be wasted, an additional saving is realized. Charcoal has been found beneficial to fowls as an aid to digestion.

ELECTRIC WATER-PIPE HEATER DOES AWAY WITH DIRT

Connected to the house water-supply system, an electric heater controlled by a push button is said to be economical and safe, and has the additional feature of being noiseless. When the heating units wear or burn out, they can be replaced without the need of draining the water from the heater, and safeguards are provided to eliminate the danger of overheating.

Electric Heater, Installed with Water-Supply Tank, and the Current Control Panel

The Bell on Its Way to the Steamer with the Floating Crane; It Was Moved Alongside the Vessel and Swung Aboard, Then Securely Fastened for the Journey across the Atlantic; It Weighs Nearly Eighteen Tons

© P. & A.

LOADING BIG BELL ON STEAMER REQUIRES SPECIAL CRANE

Ordinary wharf facilities were unsuited to the loading of a huge bell for a Philadelphia department store at an English port, so a crane on a floating platform was rigged and the bell towed with a tug alongside the steamer. It weighs seventeen and three-fourths tons.

FARM-CROP YIELDS PER ACRE GRADUALLY INCREASING

In the older sections of the United States, the farms are not wearing out but are producing greater yields per acre, according to reports. Since 1885, the average yield of corn has increased eighteen per cent, wheat, seventeen per cent, oats, fourteen per cent and potatoes, thirty-nine per cent.

RAISING a

By HAROLD

Diver Going over the Side to Descend to the Sunken German Battle Fleet, While a Companion Stands Ready to Don the Helmet

FAR away from the track of steamers on the lonely coast of the Orkney islands at Scapa Flow, an army of divers for two years past has waged a battle with violent gales and shifting tides and sands for the possession of half a million tons of valuable metals.

They are trying to raise the vast hulks of twenty-two great battleships and cruisers of the former German high seas fleet sent to the bottom by Admiral von Reuter in June, 1919, when he gave the order to open the seacocks and scuttle the vessels to prevent them from falling into the hands of the allies. Important documents are believed to lie in the safes and archives of these drowned ships, but the prize for the salvors is the winning of the half million tons of valuable metals represented by the fittings and armament of the sunken craft. The cost of the operations has reached into six figures, and now only two out of twenty-five destroyers remain to be raised from their grave.

The 28,000-ton battleship "Hindenburg" has concentrated the most strenuous efforts of the divers. Her rotted hull and slimy decks are pressed down with a weight of 56,000 tons of water. Three times, since August, 1926, she has been lifted to the surface, her great rents patched and her portholes screwed home, and each time inrushing water has burst open her patched rents, and swept her back to the bottom.

The story of the adventures of the divers on the "Hindenburg" is an exciting one. The first man to step on her decks, seventy feet below the surface, quickly pulled on the shot rope for help. A monstrous forest of seaweed, with stalks as thick as a man's wrist and leaves eighteen inches wide, trailing fifteen feet in length, was seen growing out of her sides. The diver tried to wade through this submarine jungle, but was baffled. Several other divers arrived,

FLEET from "Davy Jones' Locker"

T. WILKINS

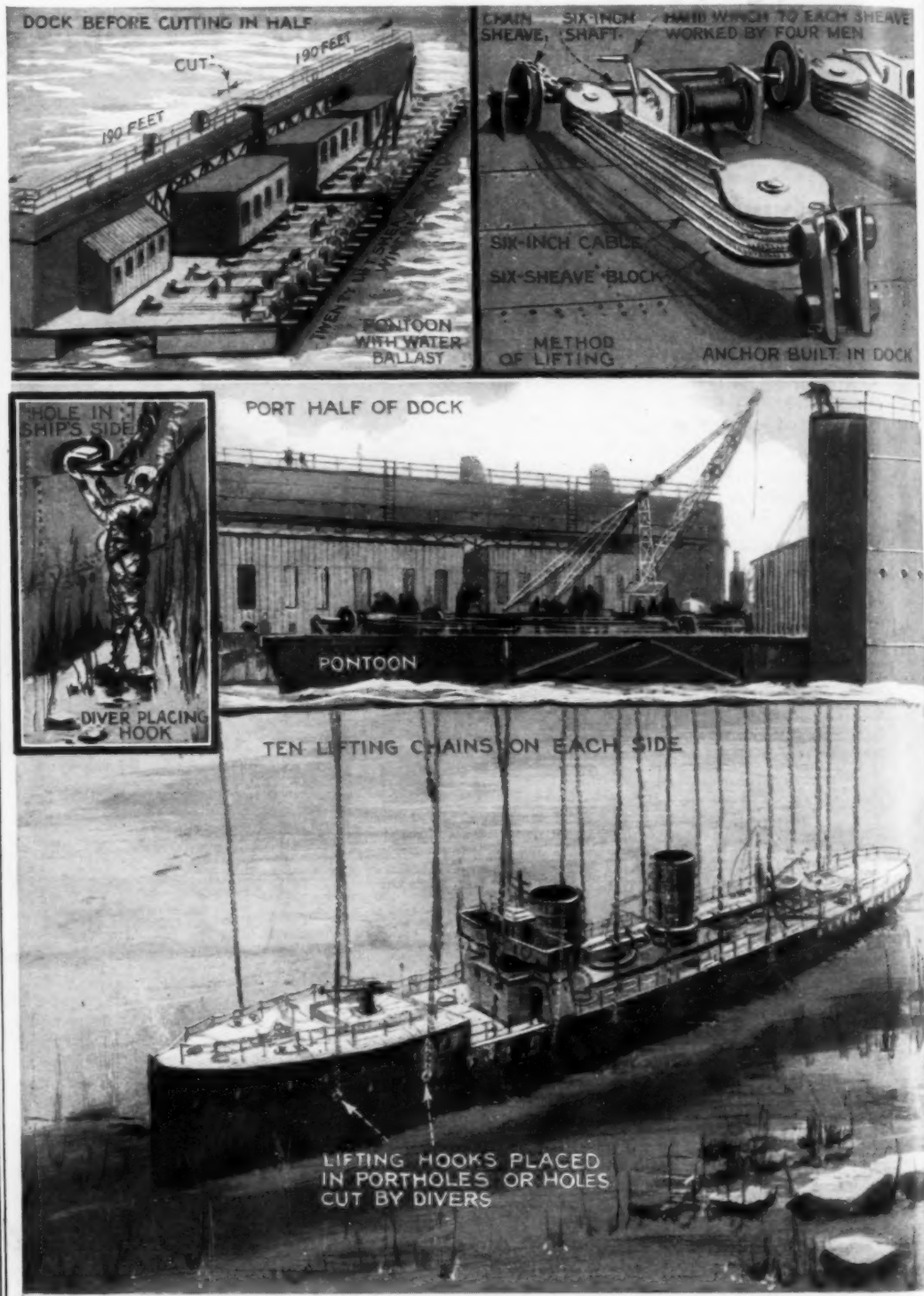
armed with double-bladed daggers, and slashed their way to the portholes.

Now began a search for the plan of the "Hindenburg." This was necessary to locate all apertures which needed sealing up before the water could be pumped out or expelled by the costly method of compressed air. In the inky blackness below, the diver's electric torch is useless even three inches away from an object, and it is fatally easy for his air line to catch in an unseen cabin doorway as he gropes his way between decks. They found the precious plan in the chart-room, etched on steel and varnished.

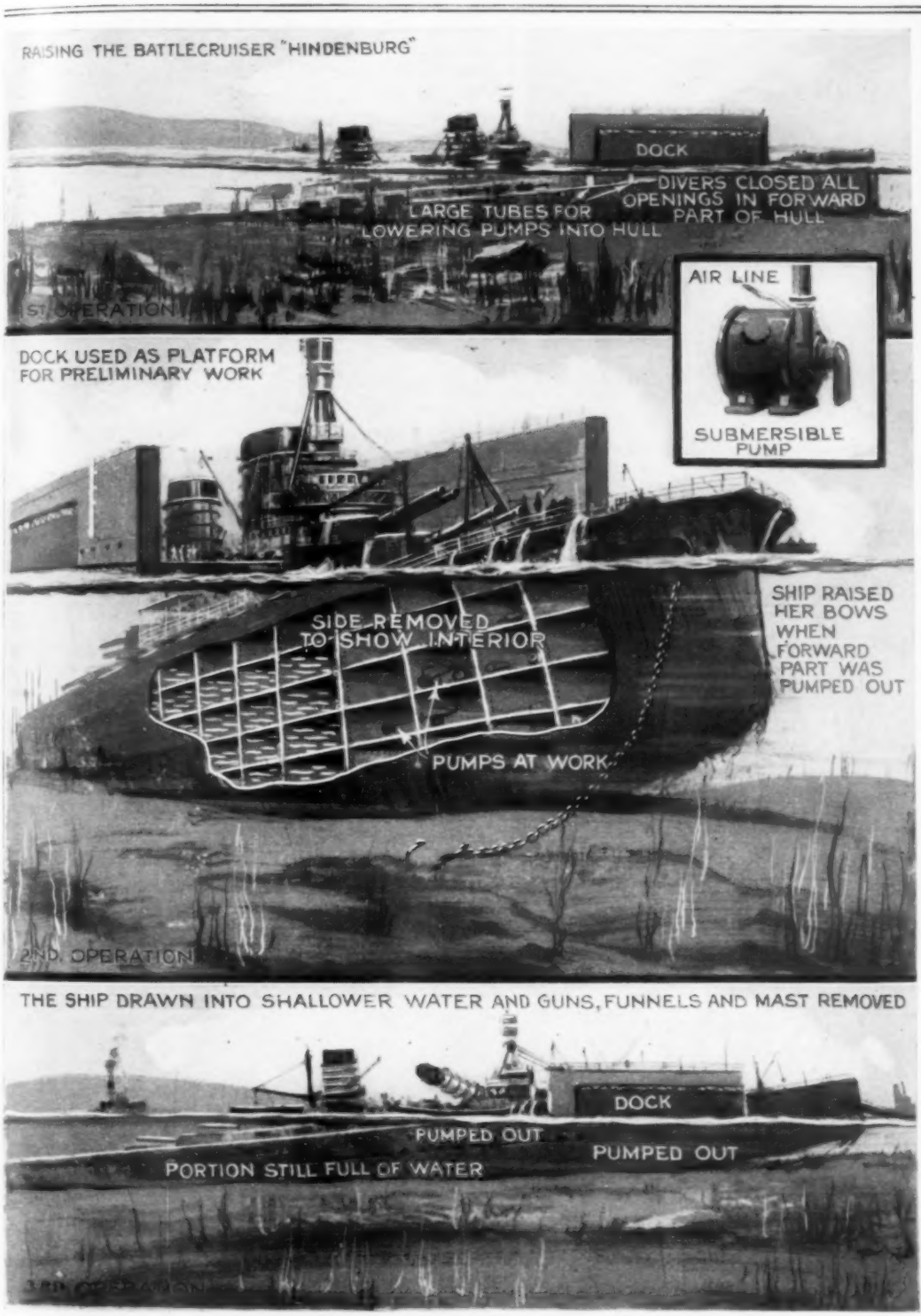
Twelve divers then set to work to tunnel under the submerged hull to get to the seacocks under the engine room, by the opening of which the "Hinden-

Battle Lookouts at the Masthead, Bridges and Funnel of the Battleship "Hindenburg," as Salvage Crews Had Begun to Raise the Great Warship

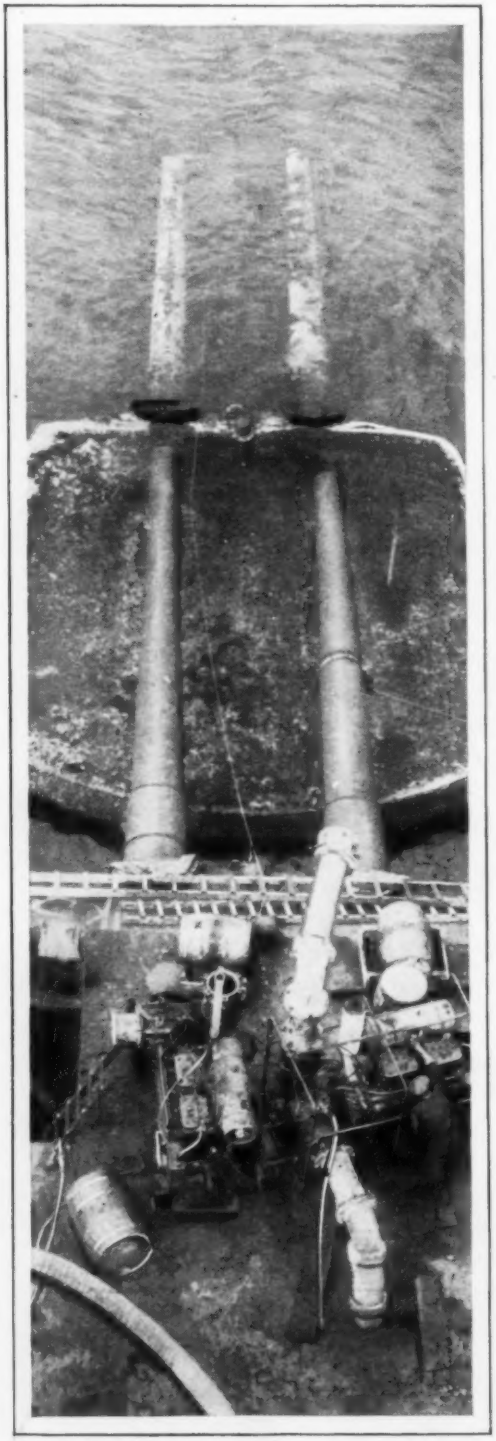
Photos © Sport & General



Courtesy the London


RAISING THE BATTLECRUISER "HINDENBURG"
DOCK
DIVERS CLOSED ALL OPENINGS IN FORWARD PART OF HULL
LARGE TUBES FOR LOWERING PUMPS INTO HULL
1ST. OPERATION
AIR LINE
SUBMERSIBLE PUMP
DOCK USED AS PLATFORM FOR PRELIMINARY WORK
SIDE REMOVED TO SHOW INTERIOR
SHIP RAISED HER BOWS WHEN FORWARD PART WAS PUMPED OUT
PUMPS AT WORK
2ND. OPERATION
THE SHIP DRAWN INTO SHALLOWER WATER AND GUNS, FUNNELS AND MAST REMOVED
DOCK
PUMPED OUT
PUMPED OUT
PORTION STILL FULL OF WATER
3RD. OPERATION

Illustrated News

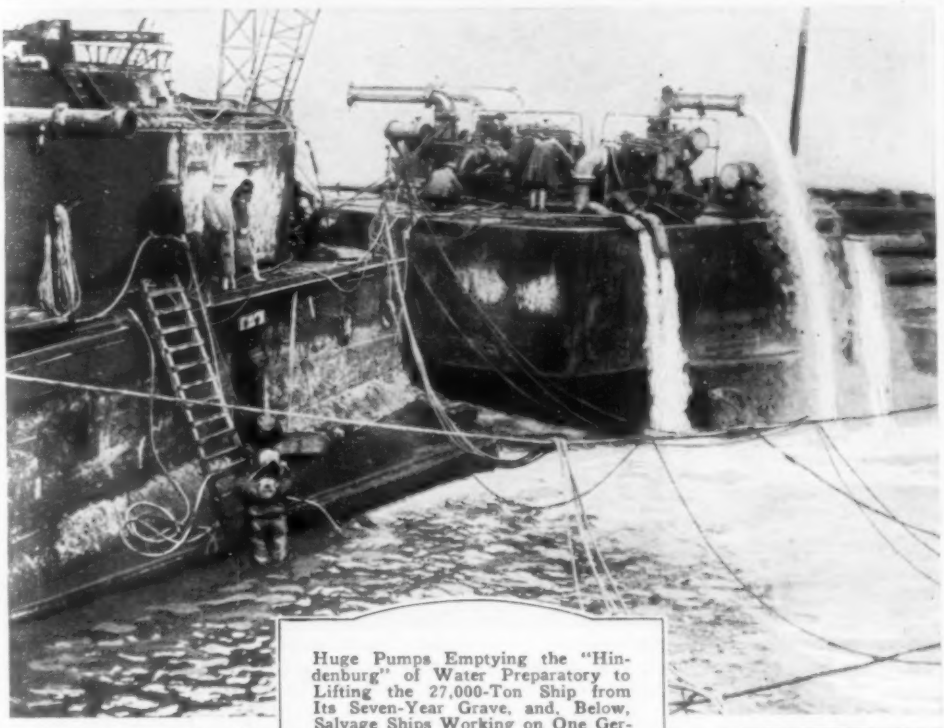


Two Big Guns in the Upper Turret above Water, and the Pair in the Forward Turret Just Visible beneath the Surface

burg" was sunk. Other divers with compressed-air apparatus scraped the barnacles off the ship's bottom and sides. While the divers were busy at this task, three great whales approached and swam round the hull. Forty pumps were started, capable of removing 60,000 tons of water in twelve hours, and seventy divers, working in continuous shifts, began on the work of stopping and sealing 700 holes in the hull. They blasted away rock pinnacles with graduated charges of dynamite, and blew off the ragged edges of the rents in the armorplate, in preparation for the enormous task of applying and water-tightening the patches.

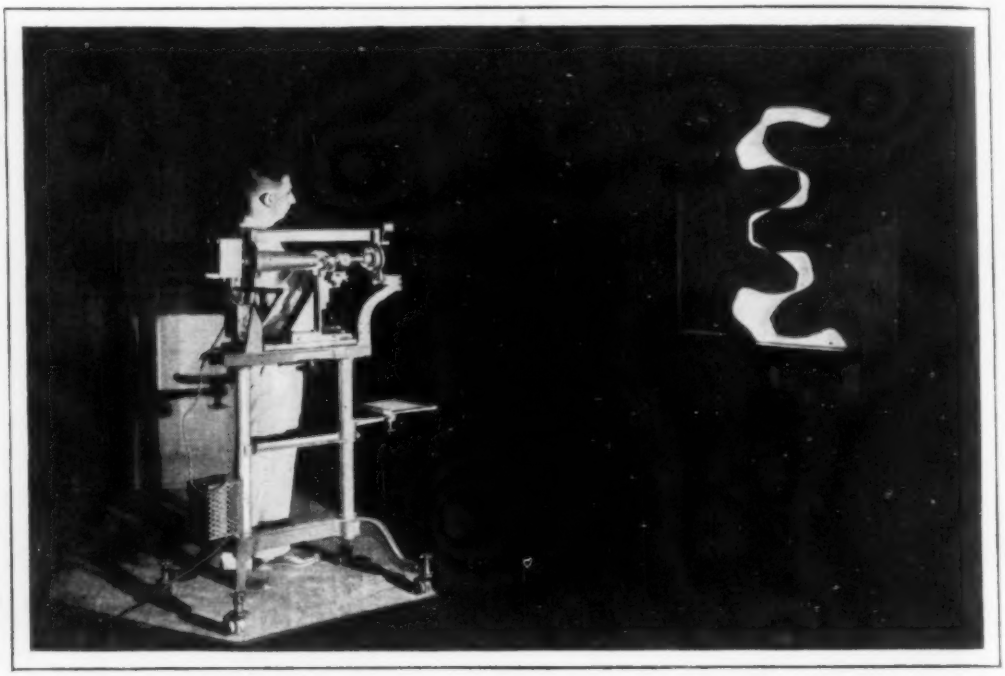
Tough steel, fourteen inches thick, was burned through in sixteen minutes by an electric arc. Such a dazzling light blazed from these arcs that the divers had to wear protecting shields over the windows of their helmets. The rents were stopped, and the portholes sealed, but by this time, the "Hindenburg" had sunk deeper into the ooze of the bottom. Tons of mud had poured into her portholes and powerful jets of water were driven by compressed air upon the mud, expelling it from the hull to the sea bed. Divers then moored pontoons on each side of the sunken battleship. Strong steel hawsers were passed under her hull, and attached to winches on each pontoon, and men strained at windlasses and ropes until the ship swung delicately balanced in the cradle of immense hawsers.

Word was given to the divers: "Stand by to lift 'Hindenburg'"; and on August 19, 1926, in a heavy gale and drenching rain, the flagstaff rose above the water followed by four twelve-inch guns. An hour passed, and the timbers of the upper deck emerged. The pumps were expelling 10,000 tons of water each hour from the hull, but the battleship slowly heeled over to an angle of thirty degrees. Three months of exertion had been wasted—she was flooded and went to the bottom again where she now lies upright with her starboard side anchored down by the sinking of some of the salved destroyers. The gigantic task of raising the remaining eleven battleships, three battle cruisers, eight light cruisers and the two destroyers still unsalvaged, probably will take about nine years.



Huge Pumps Emptying the "Hindenburg" of Water Preparatory to Lifting the 27,000-Ton Ship from Its Seven-Year Grave, and, Below, Salvage Ships Working on One German Cruiser, While Other Salvaged Vessels Lie in the Background

Top Photo © The London Times



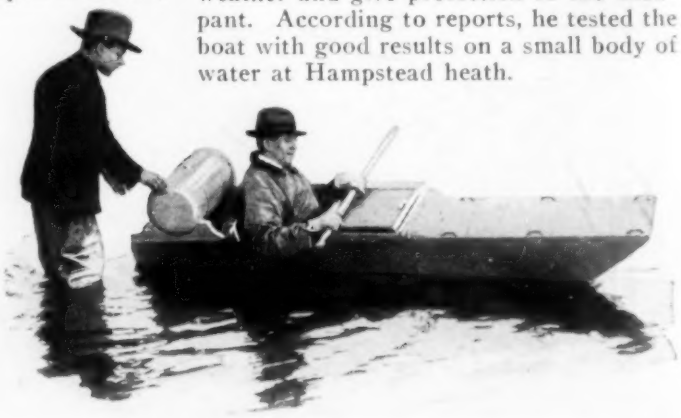
Shadow Picture of Gear Which Clearly Reveals Any Defects in the Cogs; by Comparing This Shadow with a Master Pattern on the Screen, Imperfections Are Quickly Located

HOW SHADOWS HELP TO KEEP THE WORLD IN GEAR

In keeping with the demand for greater accuracy in the manufacture of machine parts, an instrument that makes use of the simple principle of shadow pictures, has been devised for the inspection of gears and other units. It consists chiefly of a microscope and a projection apparatus by which a shadow of the part under observation is cast upon a screen, magnifying an error as small as one one-thousandth of an inch to a quarter of an inch so that it can readily be detected. The shadow cast by the part is compared to a master image that is projected upon the screen at the same time for the purpose of speedily detecting errors. An advantage of the instrument is that it can be operated by persons without special training and yet gives results that only highly specialized inspectors could achieve without it.

CRUISE IN MOTORCYCLE BOAT AROUND WORLD PLANNED

Plans for a tour around the world from London, in a small motorcycle boat he has designed, are being made by an English inventor. The craft has a sidecar float and is equipped to withstand rough weather and give protection to the occupant. According to reports, he tested the boat with good results on a small body of water at Hampstead heath.



Designed for World Cruise; the Motorcycle Boat

NEW RIVER REFUGE FOR DUCKS AND WILD GEESE

Further protection for wild ducks, geese and other fowl has been assured in a new bird reservation recently established by the government on two small islands at the junction of the Columbia and Walla Walla rivers in Washington, which will be known as the Columbia river bird refuge. The rocky islets embrace about eight and one-fourth acres of ground and for many years have been a favorite resting place for wild birds. The fact that the preserve is not easily accessible by man will make it all the more advantageous to the game. It is under the jurisdiction of the U. S. biological survey.

WATCH WITHOUT HANDS TELLS TIME BY MOVING DIAL

A watch without hands, which tells the time through an indicating figure for the hour, appearing in a slot in a revolving dial, has been introduced in France. The edge of the dial is stationary and bears the sixty-minute marks. Inside their circle is a revolving dial bearing an ornamental arrow head, at the tip of which is a small slot in which the figure indicating the hour appears. If the figure showing is eight, for example, and it is under the ten-minute mark, then the time is 8:10. The watch is particularly useful in those continental countries like France where the day is divided into hours numbered from one to twenty-four, instead of a day and a night.

Blind Children Feeling the Huge Relief Globe, to Gain Knowledge of Geographical Features

BLIND USE FINGERS TO "SEE" BIG RELIEF MAP

Blind children at the Perkins institute in Watertown, Mass., are taught to study, play and work in spite of their handicap, and much is done toward fitting them to earn their own living. By means of a special globe in relief, they learn geography, their keen sense of touch enabling them to "visualize" the outlines and contours of the continents and countries. The surface of the sphere is especially marked so that they can interpret it easily.

ELASTIC SEALING FOR BATTERY WON'T CRACK OR RUN

For sealing storage batteries, filling cases of B-eliminators, and similar work, an elastic material, recently introduced, is said to have distinct advantages in that it will not crack in extremely cold weather and will not run under high temperatures. It is also said to adhere firmly in spite of vibrations, is easily cut for repairs and has a brilliant surface when torched.

To Help the Pedestrian in Crossing the Street; the Moving Arrow in Center Indicates Walking Time

TRAFFIC-SIGN ARROW TELLS TIME BETWEEN LIGHTS

A revolving arrow which indicates the length of time before the next change, is the feature of a traffic light designed to make driving faster and easier. The pointer, which is visible a block away, turns slowly and points straight upward at the moment the lights change. A driver approaching the signal is thus able to adjust his speed so that he will reach the intersection at a period when the "go" light is on. Many less sudden stops and starts will result, the designer insists. The signal will also reduce the danger of the pedestrian, who often leaves the curb only to find himself in the center of the street when the light signals change.

NATURE'S BALANCE WHEEL

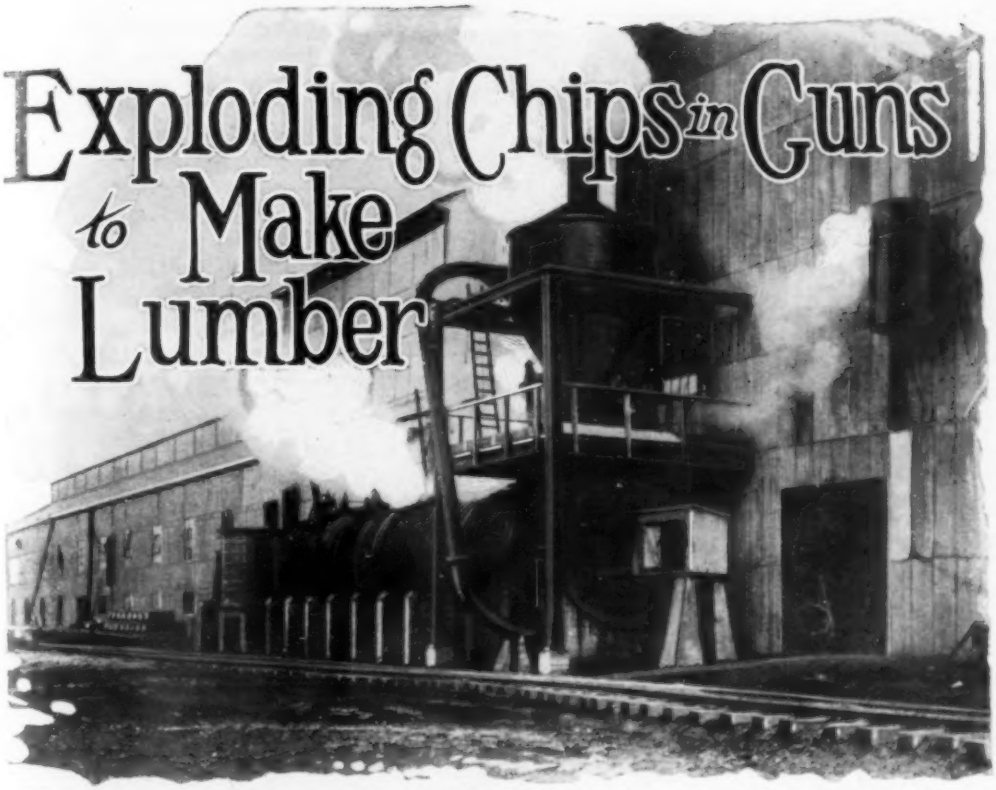
Nature seems cruel at times, especially in the destruction of various forms of life, but if all creatures were allowed to go on multiplying unchecked, serious results soon would follow. Statisticians estimate that if the eggs of a codfish were all allowed to hatch, start their lives and multiply in turn, but a few years would be required to choke the seas with this kind of fish alone. In less than ten years, rats would greatly outnumber the human population if they lived unmolested. If death did not occur among the birds, in twenty years, the descendants of one pair would number thousands of millions and, in a few seasons, flies would sweep the entire earth if they all multiplied unchecked. Another expert calculates that, if all the human beings born lived to be seventy years old, sixty per cent married and had but two children who also lived to be seventy, in 150 years the earth would be a mass of humanity hardly able to move.

SPEECH PRODUCED BY BELLOWS THROUGH HUMAN HANDS

Using a bellows operated by the foot, an organ-pipe reed and his fingers, an English inventor has succeeded in imitating the human voice with remarkable clearness and fidelity. He can produce the sentence, "Hello, London; are you there?" the reed serving as vocal organs and the fingers as the tongue and lips. The experiment illustrates that the natural voice is largely a mechanical result of muscular and nervous action.

The Speech-Making Apparatus; Air Supplied by Foot Bellows Is "Tuned" by the Hands at the Nozzle

Exploding Chips in Guns to Make Lumber



Where the Steam Is Allowed to Escape from the Pulp Material after "Firing" from the Guns; the "Cyclone" at the Wood-Waste Salvage Plant

Sawmill Waste Is Cooked, Turned into Pulp and Then Converted into Boards for Many Uses

IN a new process for utilizing sawmill waste, just launched in Mississippi, the slabs and edgings that formerly went to the trash burner are chopped up, placed in chambers where they are cooked with high-pressure steam, and then shot out in the form of pulp. This is pressed into boards, which are formed without the addition of any binder.

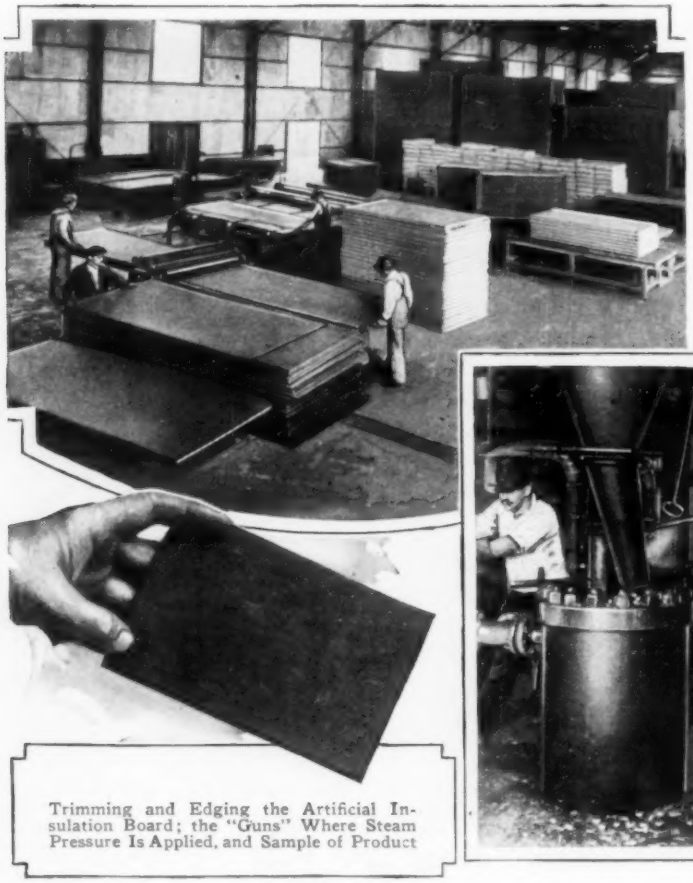
The resulting product differs from the various wood substitutes now on the market, as it consists entirely of wood, from which none of its natural elements have been removed.

The process was originated by W. H. Mason, who achieved fame during the world war by inventing a way of extracting turpentine and rosin from lumber while it was being dried.

At the Mississippi plant the waste wood is first thrown into a "hog," an inclosed, heavy iron wheel studded with knives, which reduces the material to chips. The chips are screened, and the smaller fragments and sawdust are sent to the boiler room for use as fuel. The material to be converted into fiber is whisked through a blowpipe to the chip bins.

From these bins it is fed into chambers, known as "guns," built of heavy steel. The guns point downward and are filled at the upper end by means of pipes leading from the bins. The breech of the gun is then closed and steam is admitted for a few seconds. The steam is at the enormous pressure of 1,000 pounds to the square inch and is supplied from boilers that are said to be among the most powerful in the world.

Small ports at the base of the gun are next opened, and the material is shot out at a speed of 6,000 feet a second. This



Trimming and Edging the Artificial Insulation Board; the "Guns" Where Steam Pressure Is Applied, and Sample of Product

much stronger than ordinary wood. This takes a fine polish, and can be used for furniture, flooring, and many other purposes. It is already being employed by a number of automobile companies as a backing for upholstery in cars that have steel bodies. As it is impervious to water, it also may prove of use as a durable roof covering.

violent "explosion" of the boiled chips tears them into tatters, separating the fibers of the wood but leaving each fiber coated with lignin, which serves as a natural cement.

This pulp is next whisked through a long pipe to a "cyclone," in which the steam is allowed to escape into the air. It then goes to a beater, which completes the separation of the fibers, and thence to a machine, similar to that used in paper making for producing it in an endless web, where it is formed and cut into sheets. The sheets are finally taken to steam-heated hydraulic presses, where the board is pressed into shape and the last bit of moisture removed.

Two distinct types of board are made. One is an insulation board, suitable for use in walls, ice boxes, etc. It permits the direct application of plaster or can be decorated without a plaster coat. The other product is a thin grainless board,

SLIDING TAB ON FILE CARD AID TO FOLLOW-UP WORK

The usefulness of a card-index system, particularly in follow-up references, is increased by a sliding indicator which is attached to a slotted card and simplifies finding data relating to any particular day of the week or month. At the top, the card is printed with numbers indicating the days of the month, the days of the week and the names of the months. The indicator is pointed and also has an open oval, exposing the name of one day at a time. By moving the slide to the proper date for that card and filing the index according

to a simple date system, it is easy to keep the cards calling for action on special days in an arrangement that tells at a glance, what dates are filled. An additional feature of the system is that the cards may be removed from the file box and carried in a pocket memorandum case.

RUBBERIZED SILK BATHING SUIT WEIGHS BUT SIX OUNCES

Several advantages are claimed for a rubber bathing suit recently introduced at a southern beach. It dries quickly so that the wearer may don street clothing within a few moments after leaving the water and without removing the suit. Its elasticity permits free movements, and it weighs but six ounces. The material is a silk fabric which has been rubberized to make it non-absorbent.

TELEPHONE STANDS FOR TAXIS TO RELIEVE TRAFFIC

For the convenience of telephone subscribers and to relieve traffic congestion, Berlin officials have installed fifty telephone stands along the streets for summoning cabs. They are at the service of phone patrons and are intended to reduce the number of idle cabs. By this system, the vehicles will remain in a near-by parking space and respond only when called.

Sidewalk Cab-Telephone Booth in Berlin

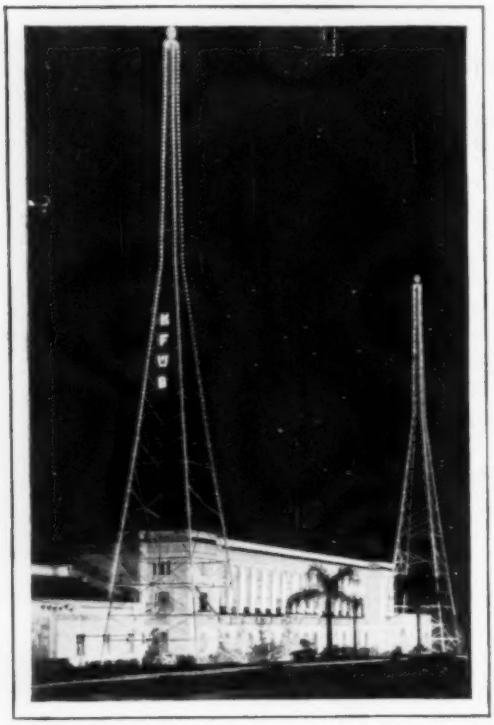
Inventor and His Clock, Showing the Passages down Which the Balls Roll and the Windmill at Top

CLOCK RUN BY BALLS AND WIND REQUIRES NO WINDING

"Perpetual motion—almost," says a San Francisco inventor concerning a clock which he has constructed, and his verdict is regarded as sound, for the clock does run without winding and almost "by itself" except that, now and then, the wind must be relied upon to give it a boost. The driving force is provided by a number of small balls which drop into a cup on the driveshaft and operate the works by their weight. At each quarter of a revolution, when the ball falls from the cup, it is replaced by another. The spent ball rolls down a chute and into an elevator, which is run by a tiny windmill, and is hoisted to the top again to repeat the cycle. There are 250 balls in the clock, sufficient to provide motive power for five days in case the wind does not blow hard enough to operate the elevator.

¶Popular Mechanics Magazine does not publish the name of the maker or seller of any device described in its pages, but this information is kept on file and will be furnished, free, by addressing our Bureau of Information.

ELECTRIC-LIGHTED RADIO MASTS GIVE BRILLIANT DISPLAY



Using Radio Masts for Night Displays; Scene Outside a Los Angeles Motion-Picture Studio

Outlined in brilliant electric lights, the 150-foot radio masts in front of a motion-picture studio in Los Angeles, are visible at a great distance and form a novel setting for the building itself, which is illuminated with floodlights. Since the slender braces of the radio towers can hardly be seen at night, the effect of the chains of light, apparently unsupported, is unusually attractive.

THIEVES ARE TRAPPED BY DYES FISHHOOKS AND WHITEWASH

Piles of coal stored in open yards are sometimes protected against theft by the simple expedient of covering them with whitewash so that any removal can easily be detected. In various hotels, thieves are occasionally trapped by connecting objects with an electric alarm in the manager's office, so that a signal is given in case an attempt is made at removal. One of the most effective aids to the detective at times is methylene blue dye. Money is treated with it and so leaves a telltale stain on the hands of persons taking the coins or bills. Washing only spreads the evidence, for a stain is left on the towel. After one hotel manager had received repeated complaints of theft from guest-rooms, he arranged an electric signal on the doors and, in the pockets of garments, placed a number of fishhooks. One day the alarm sounded and detectives rushed up to find a man trying to free his hand from one of the hooks in a coat pocket.

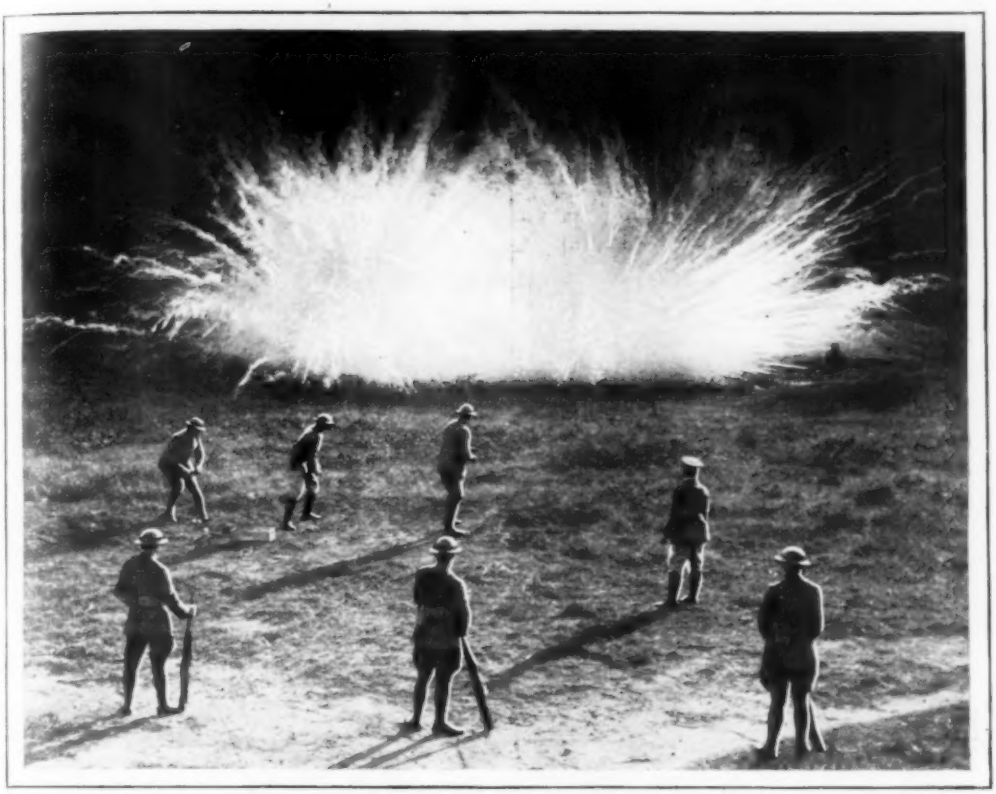
INSECT YIELDS CAMPHOR

In a small insect discovered in the forests of Sumatra, an English naturalist sees a possible rival of the camphor tree as a source of the useful drug. The creature secretes a milky fluid which possesses the properties of camphor, it is said, and the suggestion has been made that these insects might be raised artificially, as are silkworms, to produce camphor, which is now obtained from trees.

MODEL GLIDER PLANE SAILED WITH RUBBER BAND

Movements of a real airplane are imitated by a small glider which is shot from a rubber band attached to a small stick or pencil. By changing the wings, and making other adjustments, the glider can be made to loop the loop or fly straight. The parts are assembled with rubber bands to hold them securely in place.

Launching Toy Airplane with Rubber Band, Which Serves as an Effective Catapult



Hand-Grenade Practice during Night Maneuvers at the Presidio; Brilliant Glow of Missiles Burst Lighted a Wide Area and Helped Register Hits

HAND GRENADES REGISTER HITS WITH PUFFS OF SMOKE

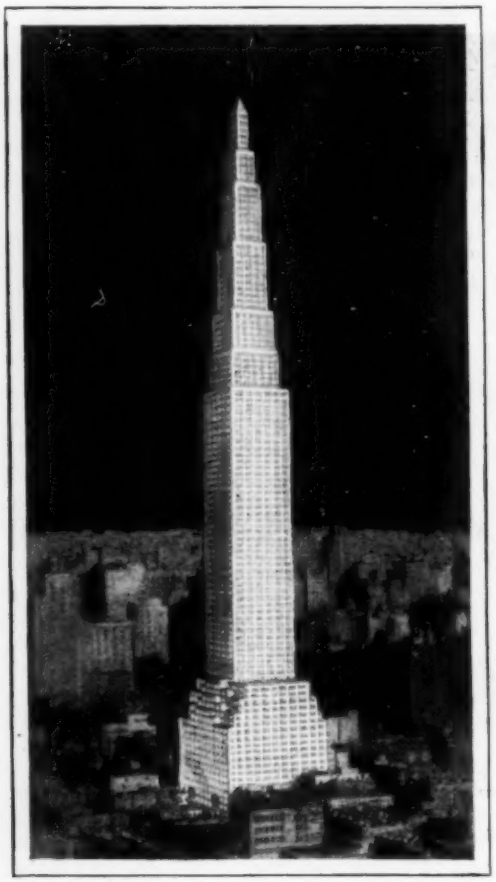
Picturesque "blossoms" of smoke dotted the Presidio in San Francisco during recent hand-grenade practice by members of the Thirtieth infantry. The puffs afforded a visible record of the results and showed, according to officers, a high standard of marksmanship.

WORK DONE BY COAL DOUBLED WITH FRAGRANT CHEMICAL

Chemists report fairly successful tests with a white substance that has the odor of the geranium, only more powerful, in obtaining increased service from coal. The "trick" consists in using the chemical in one boiler to run an engine, while the exhaust vapor, still extremely hot, is used to raise steam from ordinary water in a second boiler. The material has been recondensed and reused repeatedly at a pressure of 200 pounds to the square inch and at a temperature of 800 degrees Fahrenheit, with but little deterioration, it is said. It is slightly heavier than water and is much less expensive than mercury, which has been used in a similar way.

ENVELOPE POST-OFFICE SIGN AIDS TOURIST VISITORS

Finding the post office is an easy task for tourists passing through or visiting a Michigan resort, for a large sidewalk sign in the form of an envelope attracts attention as it projects from the building. It is fashioned of boards and the design of a letter has been carefully followed except that the stamp is not duplicated, to conform with the law.



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Sketch of Proposed Larkin Tower, to Be the Highest Building in the World

PLAN HUNDRED-STORY BUILDING HIGHER THAN EIFFEL TOWER

Patented methods of construction are to be used in the proposed 108-story Larkin tower at Forty-second street, near Eighth avenue, in New York city. A method has been devised to connect the units of the framework so that swaying in a gale will not be greater than in other high buildings, it is believed. The structure will be 1,208 feet high, topping the Woolworth building by 416 feet, the Book tower building in Detroit, Mich., by 335 feet and the Eiffel tower, for nearly forty years the highest structure in the world, by more than 200 feet. The base portion will contain eighteen stories and the tower itself ninety. Besides these, there are two stories below the street level, making 110 in all.

SWIMMING POOLS AS ICE PONDS BRING CITY REVENUE

Gregory, S. Dak., has developed an interesting plan for raising money and serving its citizens, the idea having worked so well that it has helped place the city on a firm financial basis, out of debt. In the park are two concrete basins, one fifty by eighty feet and the other forty by eighty. In the summer time, these are used for swimming, but in the winter they are drained, sterilized and then filled with pure city water. The ice that forms is stored in a municipal ice house and sold during the summer at about half the prevailing price in most towns. It finds a ready market for it is both clear and of better quality than the usual natural pond ice.

GRINDER SAVES USER'S EYES FROM GRIT AND DUST

Several advantages are claimed for a motor-driven horizontal disk grinder, as compared with the vertical type or ordinary emery wheel. It is said to produce a flat finish more easily and is portable; dust, grit and sparks cannot injure the operator, the danger of breaking wheels is eliminated and production is increased, as the worker has a proper support for the arm and can thus feed faster. The unit is especially useful for finishing small parts after the milling and other machine operations have been completed.

Horizontal Disk Grinder in Operation; Sparks and Dust Fly Away from Worker's Face

With the "Merry Joeys" of the Tent World

Only Woman Clown Tells of the Clever Tricks Which Win Laughs from the "Towners"

By EARL CHAPIN MAY

THE residents of Clown Alley in the men's dressing room were washing up after the matinee. Each comedian of the tented world stood close to his fellow funsters, as he soused face and hands in cold water that half filled each clown's galvanized-iron pail.

As each face lost the last remnants of make-up, there emerged the veteran Louis Plomonoin with his laughing eyes; Buck Leahy, who doubles on the Roman rings and does a roaring knockabout; Fred Leslie, Clyde O'Neil, Billy West, Steve Buckley and his brother Al; Gay Gibson, and others of the clownish clan.

"Which of you fellows plays the clarinet?" I inquired.

Silence fell upon the group. Its members busied themselves in hanging grotesque costumes on wire racks or packing them in the little flat-topped, iron-bound "professional" trunks which hold such an amazing quantity of circus stuff. Then Harry La Pearl, chief of Clown Alley because he is both principal and producing clown, replied mysteriously, "The clarinet fellow you're looking for will be in the cookhouse soon."

So in ten minutes Harry, looking not unlike a small-town clothing dealer as he stepped briskly along in his neat sack suit, joined me. We were in the circus backyard, whose walls are of canvas and where one finds the dressing rooms—the women's separated from the men's by the "padroom," where the fat "rosin backs," or principal horses, and the lean jumpers and members of the equine high school are fed and bedded down.

"I guess she's in the cookhouse," was all he said. Threading our way among guy ropes, tent pegs, wagon tongues, horses and elephants gathered at the watering trough, we passed the big top and

Harry La Pearl, with His Three-Foot Shoes; with His Wife, the Only Woman Clown, in Center; and Below, Mrs. La Pearl in "Merry Widow" Costume

menagerie, steered our course around the sideshow with its flapping banners depicting wild men and sword swallowers, sidestepped the stables now being torn down and loaded for the coming night's railroad run into "tomorrow's town," and thus reached the dining tent.

"The flag's still up," Harry said with relief. "We've got a steward who's keen on enforcing rules. If the flag isn't flying from the cookhouse peak you're out of luck. The dining room is closed." He grinned, then led me to one of twenty long board tables, covered with linen and set with china, glass and plated ware. He bade me sit upon a narrow, hard, blue plank at a table, and beside a fair young woman with luminous eyes. "Meet my wife," he said. Mrs. La Pearl and I shook hands.

After the steak, potatoes, beans, bread, jam and coffee had been dispatched, I reminded Harry, "You said we'd meet the fellow who plays the clarinet with the rest of your 'Joeys' on the clown band wagon in the street parade and in your clown band number under the big top during the show. That clown was funny. Why don't you introduce me?"

"I have," said Harry, gazing across his coffee cup at his wife. "Loretta La Pearl is the only woman circus clown."

"So you are the 'general,' in green coat with golden epaulets and broad hat with a high cockade, who played the clarinet so painfully in the street parade today?" I demanded. She nodded.

Loretta La Pearl became a clown because she married one seven years ago. She wanted to be with her husband, but he told her there was absolutely no demand for women clowns.

"Then let me make up as a man, and clown with you Joeys from Clown Alley," she pleaded. And she has been at it ever since.

"It's not a hard life, clowning for a circus; not after you get used to it," she says.

"Of course, an hour or so each morning riding on a hard springless seat on the roofless top of a circus wagon, in the sun or rain, is not so nice. Especially when the small boys, who think that nothing can ever hurt a clown, shoot peas with airguns or hurl peanuts at us while we are on parade. And now and then we have a runaway. But nothing really happens that can be called serious.

"Although we have such long parades and I always have to appear a half dozen different times during each afternoon and evening show, I actually am on the job less than six hours a day. And, then, the clowning trade, like any other trade, is filled with tricks. The first trick I learned was how to save myself. You see me do some knockabout stuff and funny falls when I am working on the center stage. Well, when I began to study to be a clown and Harry told me to fall, full length, upon the floor, I nearly broke my back, or thought I did. But by and by I learned the trick of making my rounded

Loretta La Pearl, Above, in One of Her Acts; in the Center, Pete Mardo in Costume, and Below, a Typical Slapstick Scene with the Slapstick About to Be Used

shoulders take most of the blow. Now I can fall or sprawl almost any way without suffering the least bruise.

"You saw, or you thought you saw my husband, as principal clown, slap me in the face. He didn't, though. There's a trick in learning to 'take the slap.' The slapper's hand barely touches my unprotected cheek, while my two hands meet, palms inward, right in front of me with a resounding 'smack.' Then one of my hands is raised rapidly to my face—and the 'towners' laugh because they think I really have been slapped. Towners always laugh if they think a clown is being maltreated in some way. But the clown slap is really a bit of sleight of hand.

"So is the explosive slapstick which all clowns use at different times. The detonating cap in such slapsticks explodes, not on the person of the clown attacked, but upon the hand of the clown who wields it. I'm talking now of full-fledged clowns who know their trade.

"Now and then Harry joins out an amateur, a youth who is known in his first season as a 'First of May.' Such a youth has confidence, but lacks judgment. We had such a one on our show last spring. He was supposed to slap me, and he did. My cheek stung for many an hour. Another First of May was instructed in slapstick exercise. The slapstick, whether it has a detonating cap or is merely made to give forth sound by flapping its two parts together, is not supposed to hit its victim hard. If you'll watch an old clown working in the ring, you'll see that this is so. But this particular First of May wanted so much to make good that he belabored Harry until we had to poultice him.

"The second-season clowns are known as 'Johnny Come Latelys.' They are the sophomores of the clown school. And the chances are that if First of Mays live through their first season and become Johnny Come Latelys, they may, in time, graduate into principal or producing clowns, such as my husband is.

"Harry originates and stages all the special clown stuff on our show. A real producing clown has to keep up with the times. When Edmund Rostand's 'Chanticleer' was having such a vogue, Harry came out with a clownish 'Chanticleer.' When the 'Merry Widow' waltz was all the rage, Harry did his first walkaround—along the hippodrome track, you know—in an enormous Merry Widow hat. He originated the dance on shoes, the soles of which are nearly three feet long, more than a dozen years ago.

"I've said that circus life is not hard. I have a lower Pullman berth which I have decorated with cretonne and made as homelike as I can. We rarely get up until eight each morning and we sleep well, although sometimes the engineer in moving the circus train about jerks it a good deal. If the circus lot is a mile or more from where the circus train unloads, we breakfast downtown, but, at any rate, from nine o'clock until eleven we have nothing to do but unpack our costume trunks, mend and wash, read letters and all that. Supper is over at five o'clock. We haven't a thing to do between that time and nearly eight, when we make up for the evening show. You see, it is not bad, although some lots are dusty and sometimes the rains follow us and things get pretty cold and damp."

After the five or six months' circus season ends in October or November, Mr. and Mrs. La Pearl are at home in their comfortable six-room cottage at Huntington, W. Va., where you will find her making potato pancakes or turning out roast chicken with oyster dressing, in which she takes due pride. While she is thus employed, her husband, in overalls,

The Clown Band in Action; Pick Out the Clarinet Player and You Have Found the Only Woman Clown in the Circus World, Loretta La Pearl, Whose Husband Is the Leader

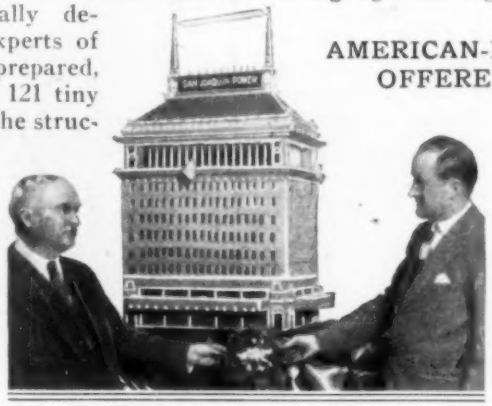
is in his shop, in the backyard of their "permanent address," making new shoes or slapsticks or canvas and wool-stuffed "snakes" which aid him in his "Hindu dance." Or he may be designing costumes for the season to come.

TWINS WHO LOOK ALIKE SIMILAR MENTALLY

Twins who look so much alike that it is hard to tell them apart have other similarities besides that of appearance, according to tests conducted recently at Columbia university, which showed their mental processes were almost identical. The tests were given to 158 pairs and showed that all sets of twins are more alike mentally than brothers and sisters who are separated by a year or more in age. Girl twins and boy twins were more alike mentally than boy-girl pairs. Sixty-three of the pairs were so alike physically that they were almost indistinguishable.

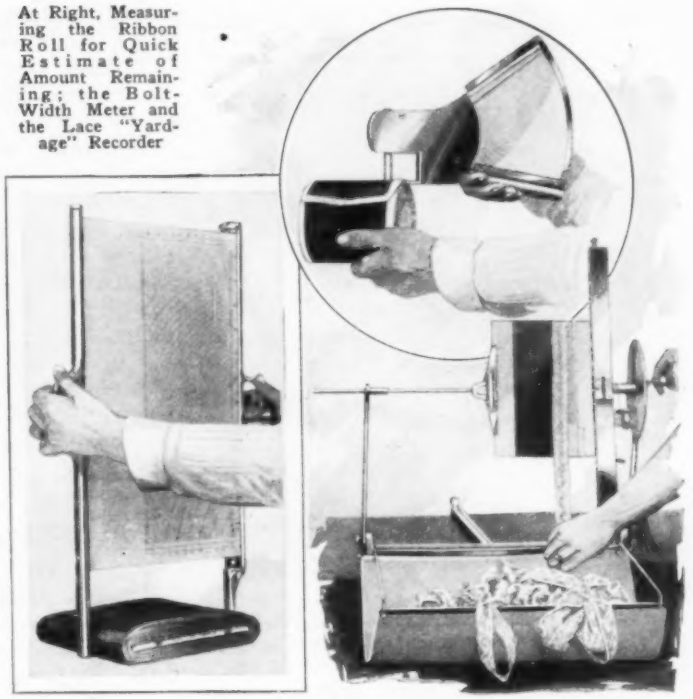
CAKE MODEL OF BIG BUILDING LIT BY FLOODLIGHTS

Engineers took a hand in the making of a 150-pound cake model of a ten-story building in Fresno, Calif. It was baked in twenty-one specially designed pans, which experts of a utilities company prepared, and was lighted with 121 tiny floodlights to imitate the structure after which it was modeled. The cake was four and one-half feet high and twenty-four by thirty inches in floor area. It was finally cut into 150 pieces and distributed among employes and friends.



Company Officials and the Illuminated Cake

At Right, Measuring the Ribbon Roll for Quick Estimate of Amount Remaining; the Bolt-Width Meter and the Lace "Yardage" Recorder



DRY-GOODS METERS SAVE TIME IN TAKING INVENTORY

Aids to the dry-goods merchant have been introduced to simplify the laborious task of taking inventory. One of them, a cloth meter, gives quick and accurate count of the folds on a bolt, while a chart, used in connection with the meter, indicates the yardage. Another instrument like the cloth meter determines the approximate length of ribbon left on a partly used bolt. A reel for winding laces has a gauge that registers the yardage.

AMERICAN-MADE IDOLS ARE OFFERED TO HINDUS

A number of mid-western firms have sent a representative to India to open an office for the sale of their products. One concern offers to make idols and other objects for the Hindus to be used in their religious rites.

Sawdust Doll and Sticks of Dynamite, Samples of What Can Be Made from the Wood-Flour Material Prepared from Substance Formerly Wasted

FROM DOLLS TO DYNAMITE IS STORY OF SAWDUST

From sawdust and other mill waste a material known as "wood flour" has been prepared and is now being employed in the manufacture of many useful articles. Among them are inlaid linoleum, dynamite and dolls. Experiments are being conducted to find still other new uses for the substance.

MAN-EATING TIGER WHEN SHOT IS FOUND WEARING COLLAR

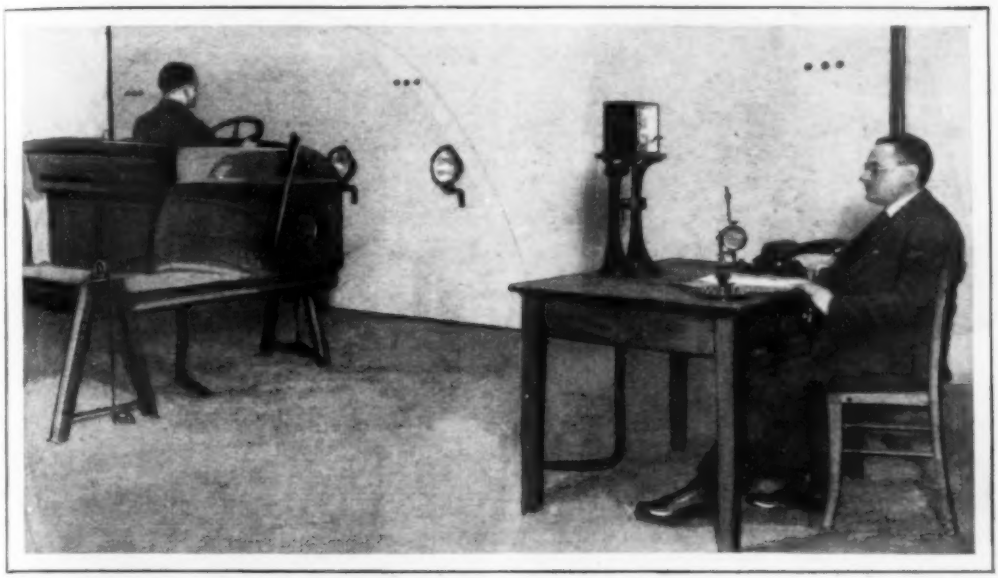
A man-eating tiger that had taken an enormous toll of human life in India for many years was finally killed recently—and found to be wearing a collar around its neck. Rear Admiral C. M. Beadnell, who reported the incident in London, said the animal at one time apparently had belonged to a menagerie, but escaped and, with the usual wild fear of man overcome through close contact with people while a captive, the beast turned killer. It was so bold that it would attack an ox-cart in broad daylight, or stalk into a village and walk off with a child under the very eyes of its parents. For years it escaped poison, traps and guns, until finally the price on its head grew so great that the number of hunters became too large for even its skill to avoid. Admiral Beadnell, who has hunted big game all over the world, also reported a thrilling lion story from one of his trips to Africa. He had shot a large rhinoceros, and was on his way back to camp, when four lions suddenly rose out of the tall grass less than fifty feet ahead. The admiral reached back to take the rifle from his gun bearer, and when it was not placed in his hand looked around to see the native vanishing over a hill in the rear. The lions began to advance. Beadnell unslung his field glasses from around his neck, held them by the strap, and, swinging them around his head, suddenly shouted and started toward the lions, who promptly turned tail and fled.

TABLET IN HONOR OF FRANKLIN PLACED AT FRENCH PORT

The 150th anniversary of Benjamin Franklin's arrival in France was the occasion of ceremonies last December at the port of Auray where he landed. A tablet was erected to his memory and one of the thoroughfares of the town has been named for him. Although France was unwilling to declare open enmity against England at the time of Franklin's visit, the diplomat succeeded in obtaining large loans for America.

Ben Franklin's Memory Is Still Cherished in France; Tablet Erected at Port of Auray

AUTO DRIVERS' SKILL IS TESTED BY MACHINE



In the Auto Drivers' Testing Laboratory; Traffic Pictures Are Thrown on Screen While Subject Handles Dummy Car as Though Actually Driving

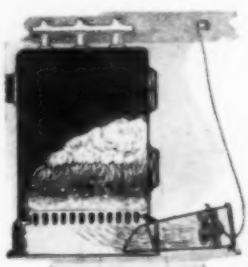
Driving problems that would commonly be encountered on the road are given candidates for chauffeurs' and drivers' licenses in Leipzig, Germany, while they sit in a dummy automobile and manipulate the controls. Close in front of the subject, is projected a motion picture of traffic in a congested district and he is required to govern his "car" as though he were actually driving it on the street. Any mistake made is registered automatically on the tape of a recording apparatus connected with the dummy auto. From the results, the examiners are able to construct a psychological picture of the subject's reactions and form a fairly accurate judgment as to his fitness. How well the candidate endured the strain is measured by a separate bit of mechanism.

SPLITTING GRANITE WITH AIR

The expansive force of compressed air is employed in an interesting way by a granite company in the south. On a sloping hillside, composed of granite that shows no bed planes but splits readily in any direction when started, a three-inch bore is sunk about eight feet deep and the bottom is enlarged by exploding a half stick of dynamite. A small charge of powder is fired in this hole which starts a horizontal crack or cleavage. Charges increasing in size are exploded until the breakage has extended over a radius of seventy-five or a hundred feet. Then a pipe is cemented into the bore, and air is forced in under a pressure of eighty to 100 pounds. The expansion of the air extends the cleavage until it comes out at the surface of the slope. A huge sheet of granite is thus separated.

FURNACE BLOWER SAVES COAL AND MAKES QUICK FIRE

Operated from the lighting socket, a portable fan blower directs a strong air current through the ash door of the furnace or heater. An adjustable, hinged unit at the end of the air tube, permits sending the draft where it is most needed, at the rear, middle or front of the grate. The outfit weighs but twelve pounds and can be used without making any changes in the furnace.



QUEER BUILDINGS THAT CATCH EYE IN THE WEST

Replica of the Sphinx, Built for California Real-Estate Office, Attracts Attention of Passers-By, and, at Right, Cottage in a Tree Constructed by Aged Man in One Week

Prospective Buyers Obtain a Good View of Property from This Lighthouse Tower on Subdivision; the Lookout Is Illuminated at Night; Castle at Right Is Real-Estate Salesman's Office and Has a Drawbridge and a Miniature Lake on the Carefully Landscaped Grounds

DIKE OF ICE SHUTS OFF WATER FOR SUBMARINE BUILDING

To facilitate submarine construction at Husum, Germany, an interesting method of shutting off the water has been developed. Instead of using sheet piling or building caissons, a solid ice dike is formed by sinking a system of pipes along the line the dike is to follow and partly filling them with liquid air, which, when evaporating, lowers the temperature to 180 degrees Centigrade below zero. In a few hours, an ice wall, nearly ten feet thick and projecting out of the water about six and one-half inches, is formed and can be maintained as long as liquid air is supplied for continued evaporation, while the shut-off area is pumped out and until a permanent dike is built. The undertaking at Husum aims to shut off the bay by a wall nearly 5,000 feet long and will be followed by larger projects. The method is not applicable everywhere, but lends itself particularly for regulation of river courses and reclamation of land, and is said to be economical.

WIND BLOWS GIANT WHISTLE CUT FROM WILLOW TREE

Making willow-tree whistles is a favorite sport in many lands, and the world's record for size is probably held by some English boys who made a whistle ten feet high and twelve inches in diameter, and then let the wind blow it. It was constructed along the same lines as the toy article and roped high in a tree where the mouth end would receive the full blast of the breeze. When a strong wind came up a few days later, it blew the whistle so loudly that it caused considerable alarm until the source was discovered. The whistle finally came to an unlucky end, for an exceptionally strong wind tore it from its moorings.

In the Combination Goldfish Hospital and Home; Distributing Fish among Storage Tanks

LONDON SHOP IS GOLDFISH HOME AND HOSPITAL

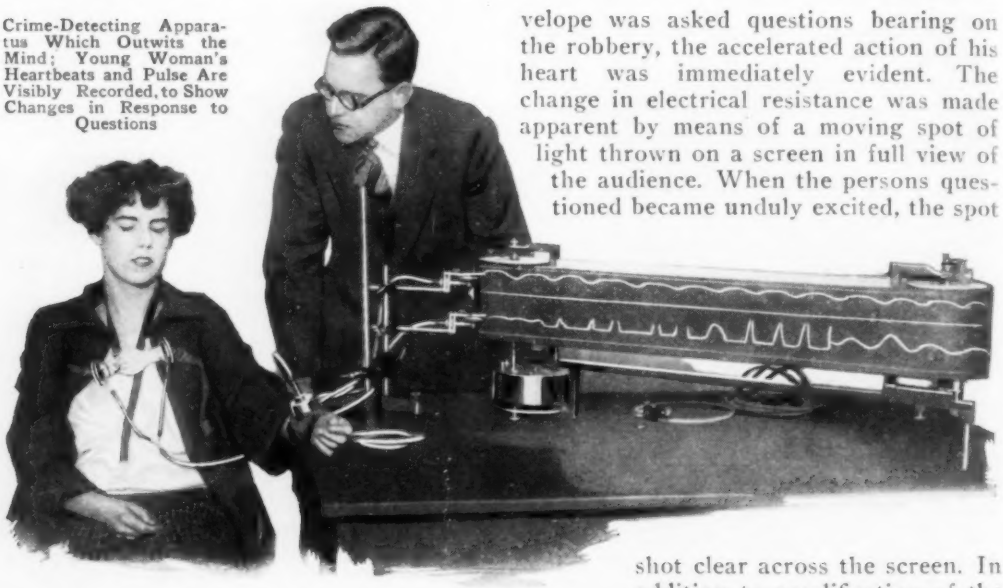
Ailing goldfish receive careful treatment at an interesting store in London where the pets are cared for when their owners are away. The proprietor has become known as the fish doctor and is said to do a brisk business as he also keeps a stock of unusual and decorative specimens.

SAFETY ZONE MARKED BY POSTS TO PROTECT PASSENGERS

Insuring Cleveland Street-Car Passengers Extra Safety While Waiting; Posts around Safety Zones

Lengths of steel pipe, set firmly eight feet apart in the pavement around the safety zones in Cleveland, Ohio, have been found effective as further protectors of persons getting on and off the street cars. At the entrance to the zone, there is a special bumper post, and an amber light on another post warns the motorist to be cautious.

ELECTRICITY IS USED TO SOLVE CRIME MYSTERY



Crime-Detecting Apparatus Which Outwits the Mind; Young Woman's Heartbeats and Pulse Are Visibly Recorded, to Show Changes in Response to Questions

By the application of special electrical instruments, a robbery was solved in less than an hour during an interesting test in New York recently. The demonstration further indicated to what extent science is now able to aid in the war against crime. Three persons in the audience were given sealed instructions and sent from the room. In one message, the holder was required to go to the tenth floor and remove $10 from an envelope in a coat pocket. When all the subjects had returned, the instruments were adjusted and the reaction of each was studied while questions were asked. By quickened heartbeats, and by a change in the electrical resistance of his skin, due to an effort to conceal the truth, the "culprit" was easily detected. The heartbeat test was made with an improved stethoscope which amplifies the sound of the heart 100,000 times. When the young man who had opened the envelope was asked questions bearing on the robbery, the accelerated action of his heart was immediately evident. The change in electrical resistance was made apparent by means of a moving spot of light thrown on a screen in full view of the audience. When the persons questioned became unduly excited, the spot shot clear across the screen. In addition to amplification of the sound, the heart-measuring instrument translates the beats into lines on a chart so that the pulsations can be detected.

ELEVATOR ON BAGGAGE TRUCK PREVENTS BREAKAGE

To save time and work in handling heavy shipments, such as safes, machinery and crated goods, a baggage truck with an elevating platform, which can be operated by one man, simplifies the task of loading or unloading. The elevator can be raised level with the car floor, thus saving lifting and reducing the likelihood of dropping the goods with consequent breakage. The operation is performed by means of a worm gear and the lift has a capacity of 3,000 pounds. The truck also has a safety handle which locks automatically in a perpendicular position and prevents children or others from stumbling over it. A

Safe Lifted to Level of Baggage Car on Elevator Truck for Easy Loading

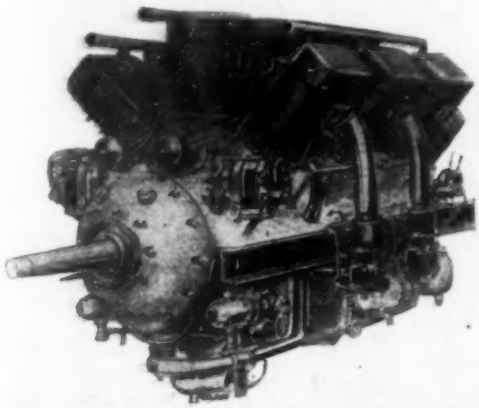
wheel lock, thrown in or out of gear from the front, top or rear of the truck, prevents the vehicle from moving when a load is being handled.

HOW THE "BIG TOP" IS MADE

Much has been written of the fascinating life and activity under the circus tent but few persons give a thought to the "big top" itself. The largest circus tents weigh twenty tons or so, about forty per cent in cloth and the rest rope. Instead of being extremely heavy, the material is but slightly heavier than the cloth for the pockets in men's clothing. Some of the larger tops contain as much as nine miles of rope. Most tents do not last longer than a year on the average. Old ones are cut into pieces and sold to farmers as tarpaulins or to interior decorators for covering furniture while papering or painting. An investment of $10,000 to $16,000 is not unusual in a single large tent for the big circuses.

RECORD MOTOR FOR AIRPLANE HAS EIGHTEEN CYLINDERS

Experts attribute the success of France in the field of aviation not only to the skill of her flyers but to the efficient equipment her engineers employ. This is illustrated in motors for the planes. An eighteen and a twelve-cylinder type are said to hold more world's records



Eighteen-Cylinder Motor for French Airplane, Capable of Developing 700 Horsepower

than any other make. The former develops 700 horsepower and the latter 500.

Delivering Shoes for Repair in Sidewalk Hopper That Is Always Open, Though Shop Is Closed

SHOP THAT NEVER CLOSES HAS POST-BOX "ENTRANCE"

Attendants in an eastern shoe-repair shop leave after working hours, but the store really never closes, for customers can deliver shoes to be mended through an opening in a sidewalk post box. Instructions are included with the bundle so that the menders can begin on the shoes the next morning. The proprietors declare that the plan has resulted in a marked increase of business.

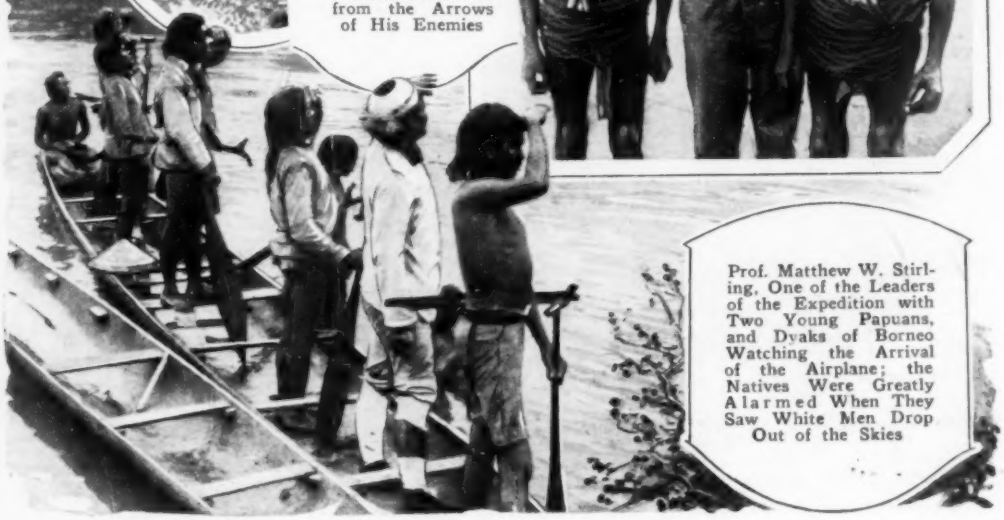
COLD AIR PUMPED INTO HOMES AS SUBSTITUTE FOR ICE

Instead of filling the ice box, residents in a Texas city simply turn a jet and a flow of frigid air emerges to preserve food and other supplies. The air is pumped through pipes similar to gas mains from a central plant, and the plan is said to be especially suited to refrigeration in large storage rooms.

ROARING *into the*

Where Airplanes Were a Curiosity; Rigging the Ship in New Guinea Wilds

Papuan Warrior in His Rattan Armor, Which Shields Him from the Arrows of His Enemies



Prof. Matthew W. Stirling, One of the Leaders of the Expedition with Two Young Papuans, and Dyaks of Borneo Watching the Arrival of the Airplane; the Natives Were Greatly Alarmed When They Saw White Men Drop Out of the Skies

LAND of the PYGMIES

After the Thrill of Seeing the Plane, Native Papuans Posed with Members of the Expedition

Left, Dyak Chief after Ride in the Plane, and Boat Maker with Odd Haircut

Lifting the Plane aboard the "Fomalhaut," at Batavia, for the Journey into Jungle Wilds; the Expedition Led to Regions Never Before Penetrated by White Man; the Plane Was Used for Carrying the Necessary Supplies and for Aerial Surveys

Where Napoleon Read and Pondered; Interior of His Private Library Now Preserved in Fontainebleau Palace

NAPOLEON'S LIBRARY IS SAVED BY AMERICAN MONEY

Napoleon's 4,000 books and his private study have been made secure by recent extensive repairs on Fontainebleau palace, where the priceless collection is housed. The work was financed by the Rockefeller foundation and was directed by Welles Bosworth, an American architect. In 1810, the books were damaged by rain entering through the leaky roof. At that time, Napoleon himself ordered the holes mended. In 1924, it was found that the ancient oak beams had become so worm-eaten that immediate repairs were required. American capital came to the rescue when the French government was unable to finance the task. The work also assures the preservation of the main palace library of more than 30,000 volumes and its rugs, furniture, paintings and other valuable furnishings. Napoleon's private collection was arranged by Barbier, his personal librarian. The books are assembled in orderly fashion in alphabetical order under large brass letters fitted upon the walls near the dull oak cases. Here and there among the prevailing brown bindings, a volume in red morocco, bearing an "N" with the four crowns beneath it, distinguishes a book that had been bound especially for the emperor. The room is about fifty feet square with shelves on three sides, and to the rear is the narrow staircase that leads to what was Napoleon's private study. The public is not admitted to the library and only the president may withdraw a volume.

NIGHT-FLYING LANES EXTENDED FOR THE AIR MAIL

Success of the air mail is as much a victory for scientific illumination as for any other feature of the task, experts declare, pointing to the fact that, but for the well-lighted landing fields and the beacons that guide the pilots on their course by night, regular schedules could not be maintained, and there would be great loss of time. Extension of the air-mail service has led to the installation of chains of lights on the route between Chicago and St. Louis and on route No. 3 from Chicago to Dallas. One of the huge bulbs for a ten-kilowatt floodlight is shown in the illustration.

Bulb for Ten-Kilowatt Floodlight Used in Guiding the Air-Mail Pilots at Night

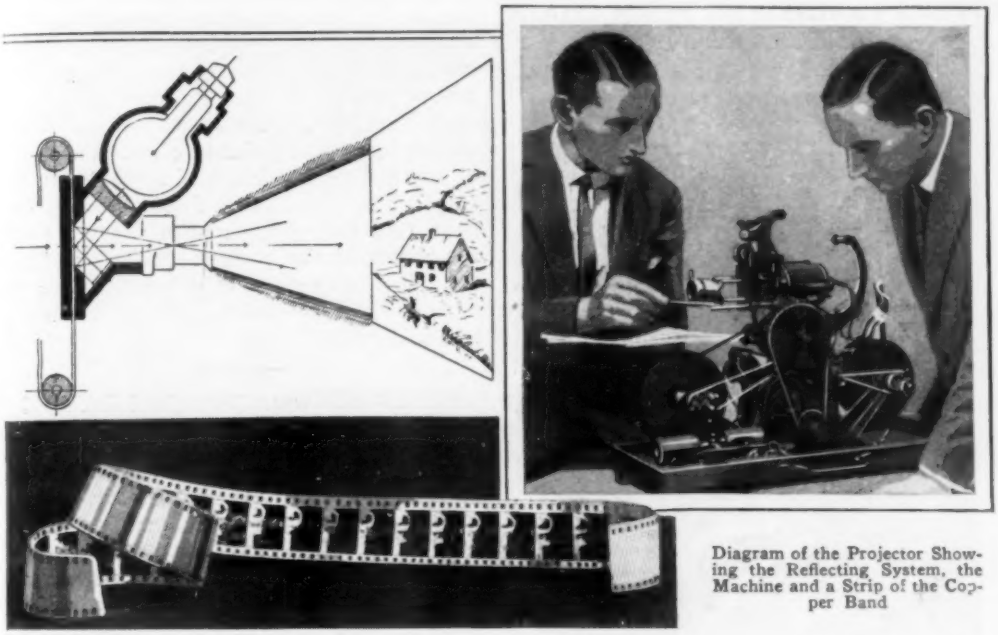


Diagram of the Projector Showing the Reflecting System, the Machine and a Strip of the Copper Band

COPPER BAND AS MOVIE FILM GIVES DEPTH TO SCENES

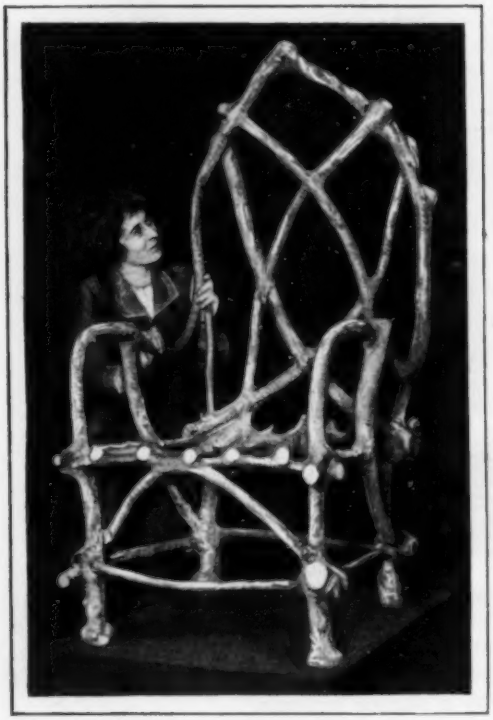
One of the dreams of the movie fan and producer as well, pictures in three dimensions, that is, with depth as well as breadth and height, seems realized as a result of an invention of two Germans. The usual transparent film is replaced by a copper band, the pictures being photographed upon it and developed in such a manner that a true perspective view of the scene is produced. The "film" is perforated in the usual manner and the mechanical operation of the apparatus is the same as in the ordinary projector, but as the copper strip is not transparent, the light source is placed in front and the image thrown upon the screen is a reflected one. The finished metal strip is said to cost no more than the standard celluloid. The perspective or plastic effect is obtained by making the exposures from four diagonally opposite points and reproducing them as one on the master film. It is also said that pictures can be shown in multi-color effects by a simple process.

VIBRATION PICTURES AID DEAF AND SHOW BULLETS' SPEED

Vibrations of almost any character are recorded on an instrument developed by an eastern research worker, by which he hopes to aid the deaf, determine the speed of projectiles, measure the recoil action of guns and perform various other interesting and helpful tasks. In assisting the hard of hearing, for instance, the apparatus would afford a picture of the various tones so that the subject could be taught to identify them by sight and thus learn to imitate them with his own voice. The instrument is expected to aid in locating artillery and airplanes.

As Man Talks into Telephone, a Picture of His Voice Is Recorded

TREES TRAINED TO FORM CHAIR WHILE GROWING



Trees That Grew Up to Become a Chair; Saplings, Trained and Grafted, Formed This Seat

From twenty-eight box-elder seeds, planted eleven years ago, a Wisconsin man has grown a serviceable chair which was sold recently for $4,000. When the saplings were three years old, they were gradually trained and grafted to take the form of the chair and, after ten years, all the trees but those which formed the legs were cut away. When the supports had grown stronger, they also were cut and the chair trimmed and polished. Only few alterations had to be made.

CARELESS DRIVERS SENTENCED TO SAFETY SCHOOL

Careless motorists in Chicago are being sentenced to attend a safety school where they are taught traffic regulations and why various ordinances have been passed, and are encouraged to ask questions to clear up any misunderstandings they may have. The plan is applied to minor violations, such as failure to stop at boulevards, passing traffic lights, making wrong turns, etc. As many as 500 persons attend a single class and the lessons are given by a competent traffic official. The school is held each Thursday. Persons who appear more than once at the training class, as a result of a sentence, are lectured severely, and a third offense leads to a fine. Officials believe that the plan supplies a great need for education in proper driving, and although it has reduced the number of cash fines, it is considered a practical influence toward greater safety.

MORE ACCURATE TIME GAUGE TO AID RESEARCH

For laboratory work, where the utmost accuracy is necessary in measuring the speed and duration of phenomena, the bureau of standards has devised a time gauge which registers half-second intervals to an accuracy of within a few parts in 100,000. It consists chiefly of a slotted pendulum which swings past a point of light. As it sways, the light, flashing through the opening, falls upon a sensitive surface and a tiny electric current thus generated is amplified while a moving photographic film records the instant.

VACUUM CLEANER IS RUN BY FRICTION WHEEL

Electricity is not needed to operate a self-generating vacuum cleaner which develops strong suction through the movement of a small fan driven by a friction wheel as the cleaner is run over the rugs and carpets. This unit is said to turn at the rate of 4,000 revolutions a minute, providing sufficient suction to remove lint, thread and dirt deeply imbedded in the fabric. It will not injure floor coverings, weighs only a few pounds and saves the bother of cords and other attachments.

Vacuum Cleaner Which Requires No Cords or Connections; Suction Is Developed by Friction Wheel and Revolving Fan

Courtesy E. R. Squibb & Sons

Extracting Antitoxin Serum from an Immunized Horse; a Single Animal in a Year Furnishes Enough Material to Treat from a Thousand to Fifteen Hundred Cases of Scarlet Fever

How Horses Make the Best Factory for Manufacturing Scarlet-Fever Antitoxin

By FREDERIC DAMRAU, M. D.

WHAT is the most effective machine for making remedies to combat human infections? A horse!

Back in the nineties, when antitoxin for diphtheria first came into use, the value of the horse as a factory for the making of antitoxins first became apparent. And today, in innumerable laboratories, thousands of horses are being sustained for the sole purpose of producing curative serum.

History repeats itself. Two distinguished physicians, man and wife, set about to accomplish, in the case of scarlet fever, what German scientists had done for diphtheria twenty-five years previously. They are Dr. George F. Dick and Dr. Gladys H. Dick. And again the horse was found to be the most satisfactory machine for making the serum. It was no easy sailing for the Dicks. Only four years ago, the cause of scarlet fever was not definitely known. Of course, everybody knew that the disease must be produced by some germ; but out of the several hundred described in medical books, each of which had already been convicted of causing one or more diseases, it was difficult to pick the one guilty of the crime of scarlet fever.

The Dicks had reason to suspect a blood-dissolving, dot-shaped germ, growing in chains, and they determined to put their theory to the test. A heroine in the form of a young woman, twenty-five years old, volunteered to submit to the experiment. She furnished the proof that scarlet fever is due to this germ by allowing

Dr. George Dick and Mrs. Dick in Their Laboratory, Where They Found the Scarlet-Fever Germ and the Means of Combating It

herself to be inoculated and suffering an attack of it.

The next step was to determine just how the germ conducts its campaign against the human body in cases of scarlet fever. Does it attack the body's cells directly or does it form poisons that travel around the circuit to spread destruction wherever they may strike?

Some germs, like those that cause typhoid, invade the entire body. The diphtheria microbe works in a different way. The germs remain localized in the throat or nose and there manufacture their poisons, called toxins, which are absorbed into the blood and travel around the body, damaging the heart, nerves, kidneys and various other organs.

The Dicks proved that the blood-dissolving germ of scarlet fever manufactures a toxin just like the diphtheria microbe. When an organ is attacked by toxins, it suffers injury. But if the damage is not too great, it promptly sets to work to defend itself. This it does by manufacturing enormous hordes of chemical combinations capable of destroying the toxin. These little substances, the protectors of the body, are known as antitoxins.

The blood of a person who has recently recovered from an attack of diphtheria, will render harmless a broth containing the powerful poison of diphtheria. In other words, the antitoxin of diphtheria renders the toxin inert. That is why antitoxin is curative in the treatment of that disease.

The Dicks proved the same condition of affairs in the case of scarlet fever. That represented a great advance. It pointed the way to a specific remedy for this plague. In other words, the Dicks determined to follow in the footsteps of the pioneers who had discovered the antitoxin for diphtheria and see if the same results could be attained in scarlet fever.

A horse was chosen to demonstrate the possibility of manufacturing an antitoxin for the cure of scarlet fever. The animal was injected under the skin with filtered broth containing the poison of the blood-dissolving germs of scarlet fever, but not the germs themselves.

At first, there appeared to be but little response to the injection. Then larger doses were given. The horse became drowsy, fed poorly, had fever, and showed an inflammatory swelling at the point where the needle had been pushed into the skin.

After very large doses of the toxin had been injected, as much as half a pint, the animal's blood was tested, to see whether it was able to neutralize the toxin of scarlet fever; in other words, whether scarlet-fever antitoxin had been manufactured. And the result represented a great triumph for the Dicks and a godsend for the thousands of children who

Upper Left, Courtesy E. R. Squibb & Sons; Others from Lederle Antitoxin Laboratories

Preparing the Final Antitoxin, Upper Left; Trying It on Guinea Pigs to Check Its Purity, Right; Making a Chemical Test, Lower Left; and Supplies Waiting to Be Packed

ordinarily fall victims to scarlet-fever infection every year.

Two teaspoonfuls of the horse's blood serum were found to contain sufficient antitoxin to neutralize an amount of the scarlet-fever poison capable of producing the symptoms of the disease in twenty grown-up men.

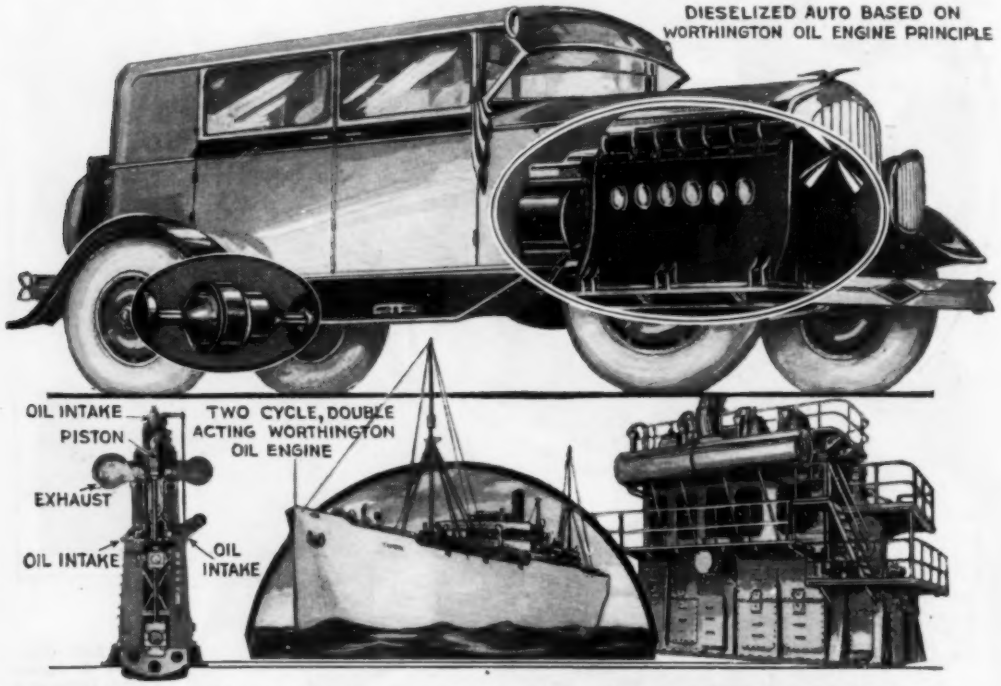
The final step in this romantic conquest of scarlet fever was the trial of the antitoxin in actual cases of the disease. For the purpose of analyzing the results, the Dicks classified 100 individuals suffering from scarlet fever. There were fifty mild cases and fifty severe ones. In the mild cases, the ordinary treatment for scarlet fever was used; in the severe ones, the antitoxin was administered.

The patients with severe cases of scarlet fever, who received antitoxin, fared much better than those with mild cases, who received no antitoxin. And complications occurred in only four of the patients who received the antitoxin, as against nineteen of those whose cases were mild and who received no antitoxin. So, the practical tests leave no doubt but that the new antitoxin for scarlet fever is a most potent, effective and entirely harmless remedy.

It is only a little more than a year since these discoveries were made and the experiments that confirmed the discoverers' hopes were completed; but already reliable manufacturing chemists are supplying the scarlet-fever antitoxin.

RACE TO TEST THE WORTH OF OIL-BURNING AUTOS

A twenty-four hour race for Diesel-engined automobiles has been announced to be held some time during September on the famous testing course of the Indianapolis speedway, where gasoline cars have tried out their new developments in 500-mile races for more than a decade. As a result, cars powered by heavy-oil engines, which the more optimistic engineers have been predicting as a development of the next five years, may be brought forward to this year. What a Diesel-engined car should be was discussed at the recent annual meeting of the American Society of mechanical engineers, when leaders in the development of heavy-oil engines declared such automobiles could be run at only twenty to forty per cent of the cost of operating a gasoline car, and likewise would cost much less to build. The fuel oil burned, costing nine cents a gallon, at present prices, should carry the automobile fifty miles, the engineers announced. "It will have no spark plugs, clutch, gear-shift mechanism or ignition system," L. H. Morrison, secretary of the engineering society, declared. "There will be more than fifty less parts in the engine; it will be several times as powerful as a present-day car of equal size, and will run on almost any oil that will flow through a pipe." Such a motor would be based on the Worthington two-cycle double-acting principle, which was developed for the engines in the "Tampa," first shipping-board vessel to be motorized. The double-acting pistons of these motors develop power on every stroke. It is that principle which the designers expect to utilize in cutting the weight of the engine per horsepower developed. German manufacturers already are building Diesel motors for trucks and heavy passenger cars with a weight of twelve pounds per horsepower.



The "Tampa," First Motorized Shipping-Board Vessel with Its All-American Diesel Engine, and Sketch Explaining the Worthington Principle, with Designer's Idea of Car Using It

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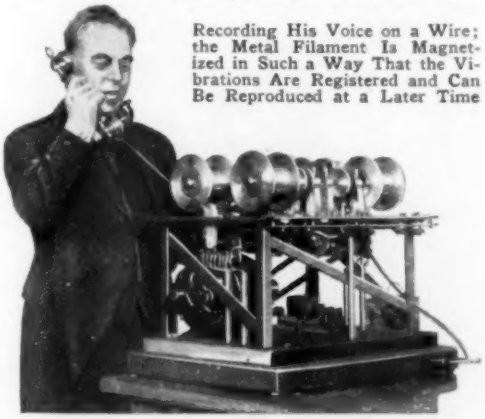
¶A dime, coined in 1783 and said now to be worth $300, was found recently by a New Jersey school girl.

SEEDS TREATED WITH X-RAYS TO INCREASE YIELD

By exposing seeds, bulbs and tubers to "soft" X-rays for a carefully measured period, a Russian botanist reports that he has stimulated their development, resulting in stronger roots and an increased yield. He explains that the soft rays are of longer wavelength than the "hard" rays which have greater penetrating power. Exposure to the soft emanation must be given for an exact time, the investigator declares, and considers his discovery of the proper length of treatment an important advance in the process of submitting seeds to X-rays, an experiment which has been attempted for some time but without encouraging results. It was found that light had the effect of lowering the yield from treated seeds, so that they must be kept in the dark until planting, and too long an interval between the exposure and the sowing also had a harmful effect.

VOICE IS RECORDED ON A WIRE AND REPRODUCED FROM IT

The human voice and other sounds are being recorded on a slender wire and reproduced at will in somewhat the same manner that phonograph records are produced and played. The essential difference is that the wire becomes magnetized in accordance with electrical impulses which it receives while the recording is being done and the reproduction of the sound is made according to like principles. The same



Recording His Voice on a Wire; the Metal Filament Is Magnetized in Such a Way That the Vibrations Are Registered and Can Be Reproduced at a Later Time

method was worked out by Viennese inventors for recording radio programs on steel bands and then playing them later.

Front of the Chili Building in Hamburg, Germany, Showing the Trend toward the Skyscraper Style

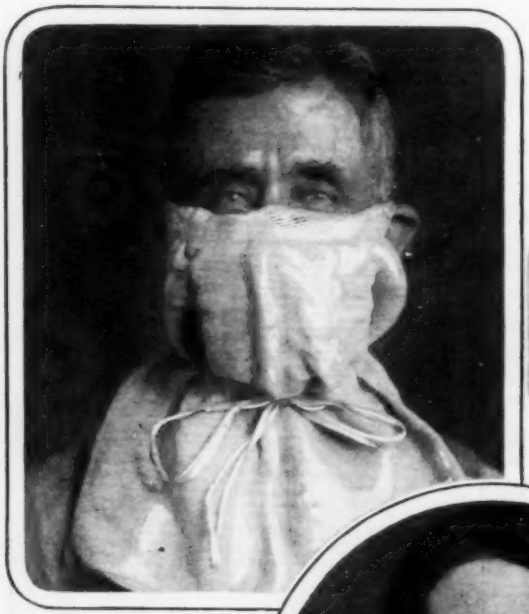
SHIP-SHAPED OFFICE BUILDING RIVALS FAMOUS "FLATIRON"

Late ideas in modern architecture have been developed in the Chili building in Hamburg, Germany, where a trend toward the American type of skyscraper has been noticed. The structure resembles the prow of a huge ship at one corner and, in this particular, is more extreme than the famous Flatiron building in New York city. An additional feature is the application of the elevated sidewalk. The upper floors of the building have promenades on the outside, where the workers may enjoy a bit of fresh air.

PLANE'S BALLOON TIRES WEIGH TWO HUNDRED POUNDS EACH

Dwarfing the automobile's equipment, balloon tires being manufactured for the huge air liners in England are seven and one-half feet in diameter and weigh nearly 200 pounds each. They are made to ease the shock in landings and can withstand a load of eighteen tons. The wheels have hubs twenty inches long and weigh nearly a quarter of a ton a piece.

QUEER MASKS USED IN DANGEROUS OCCUPATIONS



Homemade Respirator of Cheesecloth Used by White-Lead Factory Workers, Above, and a Mask with Tissue-Paper Filters, at Right

A Curious Combination of Hat and Nose Guard That Is Really a New Dust Mask Developed by the Bureau of Mines

The Filter of the Respirator at the Right Is in the Hood, Giving a Very Large Breathing Surface

Despite Its Appearance, a Pig Was Not Used as the Model for the Mask Above, Which Uses Several Thicknesses of Woolen Felt to Protect the Wearer from Breathing Dangerous Dust While at Work

TWENTY-SIX-MILE-LONG CAVE HUNG WITH ICICLES

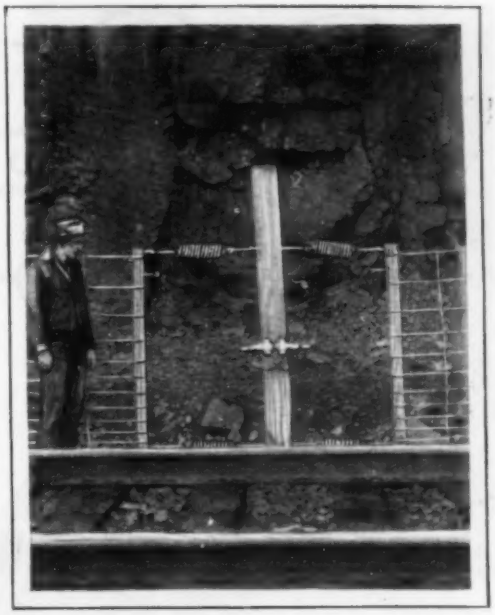
Festooned with glistening icicles that are believed to have formed 150,000 years ago, when all northern Europe and Russia were enveloped in ice, a cave twenty-six miles long has been found in the Ural mountains. It abounds with grottoes of extraordinary beauty; the roof is a mass of snow crystals that reflect the colors of the rainbow, and there are wide corridors, at the bottom of which a subterranean river probably flowed many years ago. About a mile from the entrance to the cavern is a small lake, near which were found several objects dating from the time of the Persian King Cyrus, and military fortifications probably built during the fourteenth century were unearthed near by.

SOUNDS ARE RECORDED ON FILM AND REPRODUCED AT ONCE

Records of the human voice and other sounds are made on film in such a way that they are fit for immediate reproduction in an apparatus demonstrated recently in France. The chief novelty of the instrument lies in the method by which the lines made by the recording needle are "fixed" on the film. This is done with the aid of two special liquids, held in containers with small outlets, one liquid being distributed immediately in front of the needle and the other close behind it. The first fluid flows upon the film in a narrow band and makes the material softer so that the vibrations may be registered more perfectly. The other liquid cleans and "fixes" the tiny grooves. The film dries so quickly, according to reports, that it can be rolled on a spool, which is part of the apparatus, and thus is ready for the reproduction of the sounds immediately after they have been recorded.

Courtesy L'Illustration

Recording the Voice on Film for Immediate Reproduction; Liquid That Fixes Grooves Makes This Possible



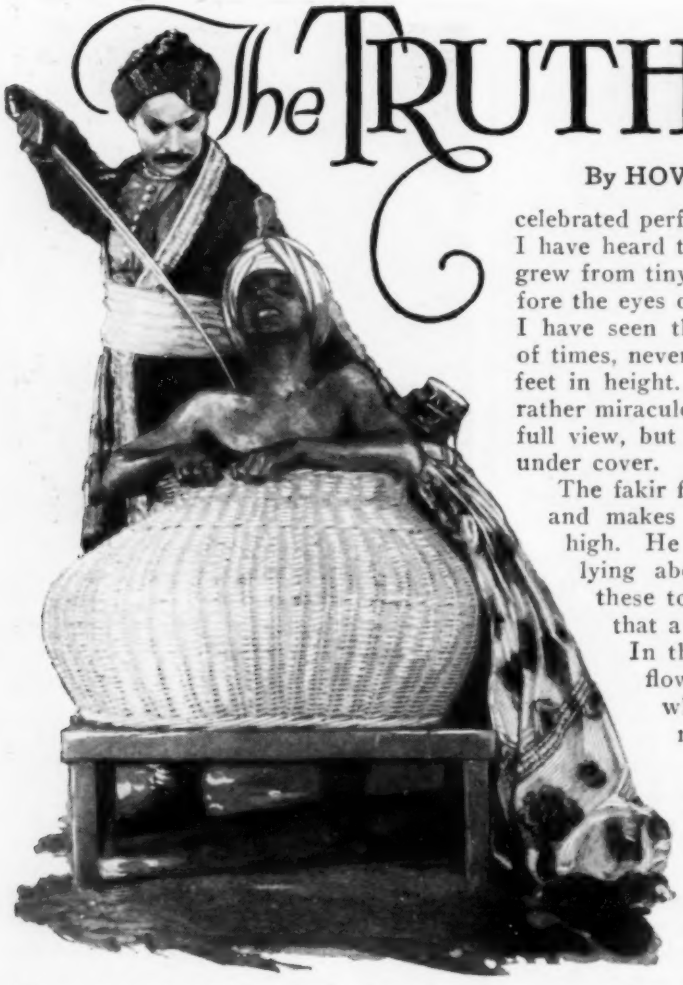
Alarm Fence on Union Pacific Railroad, Which Sets Signal When Rock Slides Strike It

GUARD RAILWAY FROM SLIDES WITH ELECTRIC FENCE

Along a stretch of line where rock slides have caused wrecks in the past, the Union Pacific railroad has installed an electric fence which is intended to give automatic warning when slides occur and thus prevent accidents. When rocks fall down and roll toward the track, they press against the slack wire of the fence, this action, in turn, pulling a switch on the nearest of a series of large posts set at 800-foot intervals. This switch operates the block signal and also affects the safety control in the engine, so that trains can be stopped. The fence is constructed of hog wire and the staples are not driven all the way in, so that the strands will have sufficient slack to operate the signal switch.

The TRUTH about

By HOWARD THURSTON



Mohammed, a Hindu Magician Imported by Thurston, Improves on the Basket Trick by Apparently Actually Stabbing the Boy

THERE are magicians in India—thousands of them—and they present certain mysteries which are baffling to the untrained observer. To a magician, however, their methods are simple, and the tricks they perform are far inferior to the illusions exhibited by American conjurers.

The magicians of India are not miracle workers. Their tricks are easily detected by an expert, yet their magic is a real art. The present generation of fakirs show tricks which have been passed down to them by their fathers. Many of the appliances used are of crude construction and this adds to their effectiveness, as they do not excite suspicion.

The "Mango Tree" is one of the most celebrated performances of Indian magic. I have heard tales of mango trees which grew from tiny roots to ten feet high before the eyes of the spectators, but while I have seen the trick performed dozens of times, never did the tree exceed three feet in height. That, in itself, would be rather miraculous if the tree developed in full view, but actually the trick is done under cover.

The fakir first takes three short poles and makes a tripod about four feet high. He has a number of cloths lying about, and he uses one of these to drape about the poles, so that a miniature tepee is formed. In the center of this is a small flowerpot filled with earth in which the magician plants a mango seed.

He now plays some weird music on a flageolet and then removes the cloth from the little tent. The mango seed has grown to a tiny sprig. The cloth is replaced, and when it is removed again, the sprig has grown taller. This procedure is repeated until finally a two or three-foot "tree" is developed. Under the loose cloths which are on the ground, the fakir has hidden branches of a mango tree. These he picks up under the larger cloth each time he forms the tent. The tree is merely a branch from a large mango tree, and it is also concealed underneath a cloth close by, with its lesser branches folded together.

The secrets of many good tricks are quite simple; it is the method of performance that creates the mystery. So it is with the smaller tricks of the Hindu fakirs. They present their tricks with an air of mystery which causes the spectators to look for some complex solution, for example, the "Bowl of Rice."

INDIAN MAGIC

An "Indian Mystery" Which No Indian Has Ever Actually Produced Is Now Done on the American Stage

The magician has a "lota," a bowl with bulging sides, and fills it to the brim with rice. He takes a knife and inserts the blade into the rice, until the knife is buried to the hilt. Then he calmly lifts the handle of the knife, and lo! up comes the bowl. The fakir swings the knife around his head, defying the law of gravity. The explanation is simple. When the knife is inserted, the rice is pressed into the bulging sides of the bowl, and the blade is gripped so firmly that the whole affair can be lifted at once. When the magician wishes to remove the knife, he gives the blade a twist.

One of the best tricks seen in India is the "Disappearing Bowl." It is performed by only a few magicians in the Madras presidency. A large earthen bowl, about eighteen inches in diameter and twelve inches high, is filled with rice. The performer covers the bowl with a cloth and jumps upon it. The bowl and rice disappear completely. Then the magician calls attention to a tree behind the spectators, and there is the bowl of rice resting securely in the branches.

The original bowl is merely a collapsible wire frame, covered with a soft clay, which is very thin; but, being covered with a varnish, it looks like an ordinary clay jardiniere. Just below the opening of the bowl is a tray containing enough rice to make the jar appear filled. The magician takes two small cloths and holds them together to look like one. He lays them on the ground and puts the bowl upon them. Then he covers the bowl with a larger cloth. During this action, he knocks the soft clay from the bowl, but the wire frame remains upright. When the magician jumps upon the cloth, the frame collapses, and it seems as though the bowl had magically disappeared. In removing the large cloth, the magician takes away the uppermost of the two smaller cloths. Thus the remains of the bowl are disposed of. Before the spectators have recovered from their surprise, the fakir points dramatically to the tree, where his confederate has quietly placed a solid bowl filled with rice.

The "Spinning Shell" is a novel effect produced by Hindu magicians. A fine straw is passed for examination and is planted in a piece of clay, so that it stands erect. Then the fakir balances a small shell on the straw and pours water on the latter. The balanced shell begins to revolve and keeps on spinning rapidly for a short time. The trick lies in the straw. The magician, upon receiving the ex-

One of the Standbys of the Indian Fakirs, the Man on the Bed of Spikes, as It Is Produced Nightly in the Theater

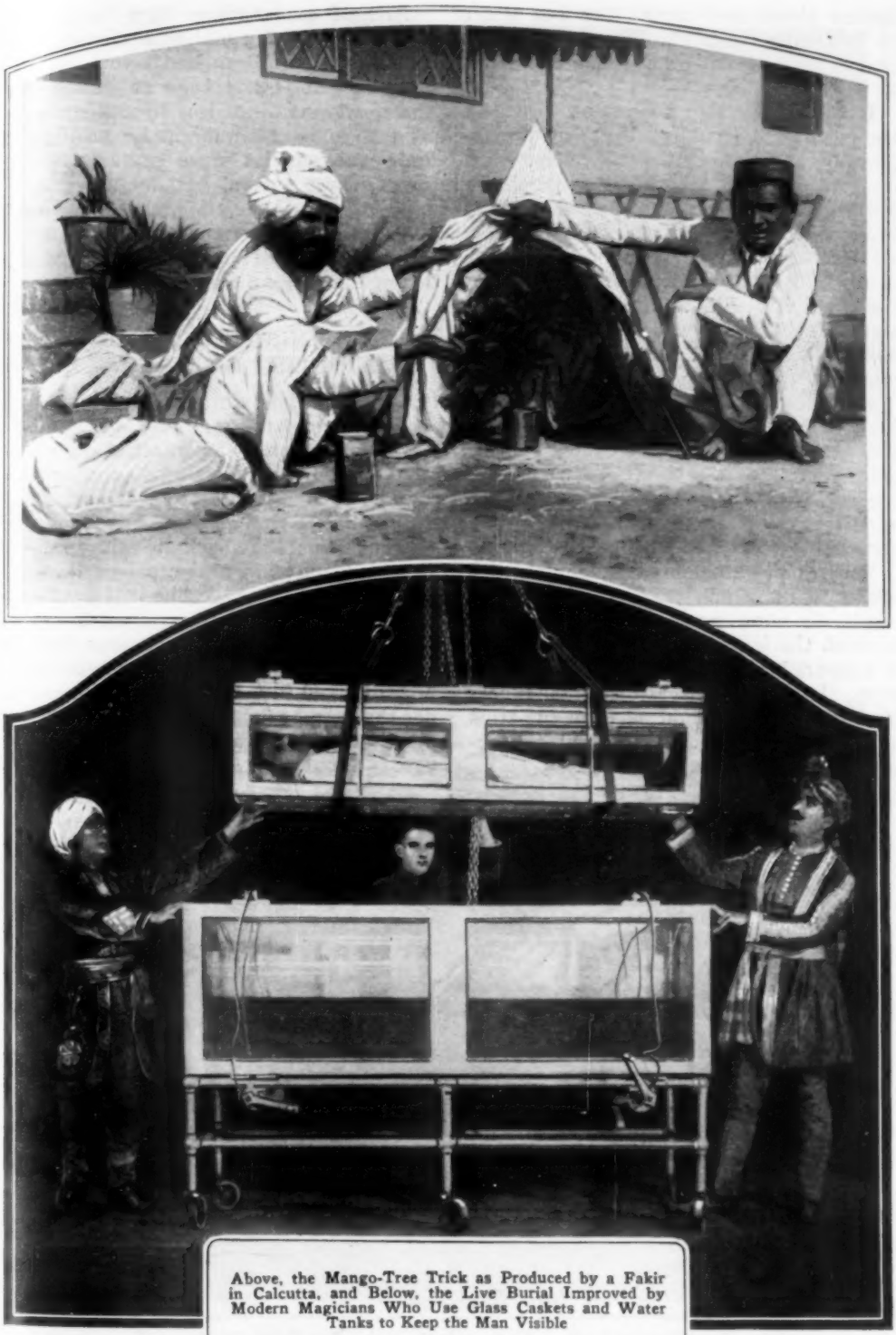
amined straw, substitutes a similar straw which is identical in appearance. The second straw, however, has been twisted and dried. Consequently, when water is applied, the straw swells and untwists, causing the shell to revolve.

I recently heard of a traveler, returned from India, who described a most wonderful trick wherein a fire was kindled upon a boy's head. The details are as follows: The boy is placed in a kneeling position, and an earthen cylinder, six inches in diameter, is set upon his head. The cylinder is open at both ends. The fakir fills the tube with paper, pieces of wood and rags, then he pours on a quantity of oil, and sets fire to the contents. A cloth is tied around the boy's head, allowing only the earthenware cylinder to appear. More fuel is added, and a great flame bursts forth. The boy screams for help, but the magician calmly increases the fire. I witnessed this mystery while in India, and learned the secret. There is a small shoulder inside the cylinder. When the fakir puts in the paper, he drops in a round flat piece of iron forming a partition which keeps the fire from the boy's head.

The minor tricks of the Hindu conjurers are charming in their simplicity. The "Shooting Arrow" is a typical example. The magician has a wooden image, which holds a bow and arrow. At a word of command, the image shoots the arrow and hits a target six feet away. I have seen the arrow hit the mark at a distance of fifteen feet.

The left arm of the image is fixed, and the bow is held in the left hand. The arrow is placed in the bow, the string being fastened in a notch on the side of the arrow. The heavy end of the arrow is pressed into a hole at the right side of the image. The hole contains adhesive wax, and after the arrow has been pressed into it, eight or ten seconds will elapse before the force of the bow will release the arrow and shoot it to the mark. The magician watches the action of the arrow as it is gradually released, and, at the right moment, commands the image to let it go.

The street entertainers of India perform many interesting and varied feats. I witnessed one of these men who plunged boldly into a tub of boiling water, and remained there for a minute or two. Then he emerged, uninjured by the hot water. The secret lay in the fact that the tub was quite deep, and that it had previously been partly filled with cold water. Then kettles of boiling water were poured in while the crowd was gathering. The performer plunged quickly through the upper layer of hot water, and lay in the cool water beneath. He



Above, the Mango-Tree Trick as Produced by a Fakir in Calcutta, and Below, the Live Burial Improved by Modern Magicians Who Use Glass Caskets and Water Tanks to Keep the Man Visible

kicked about and caused the hot water to mix with the cold. This reduced the temperature so that he could come out at his leisure.

I had heard many marvelous stories of the celebrated Indian "Rope Trick," supposedly the greatest of all mysteries. Each description bordered on the miraculous; every story involved a master fakir, who took a coil of rope, tossed it into the air and caused it to remain there, suspended. In some accounts, the end of the rope was said to have gone out of sight. Then a boy was supposed to have climbed the rope and disappeared, followed by the fakir, who also vanished.

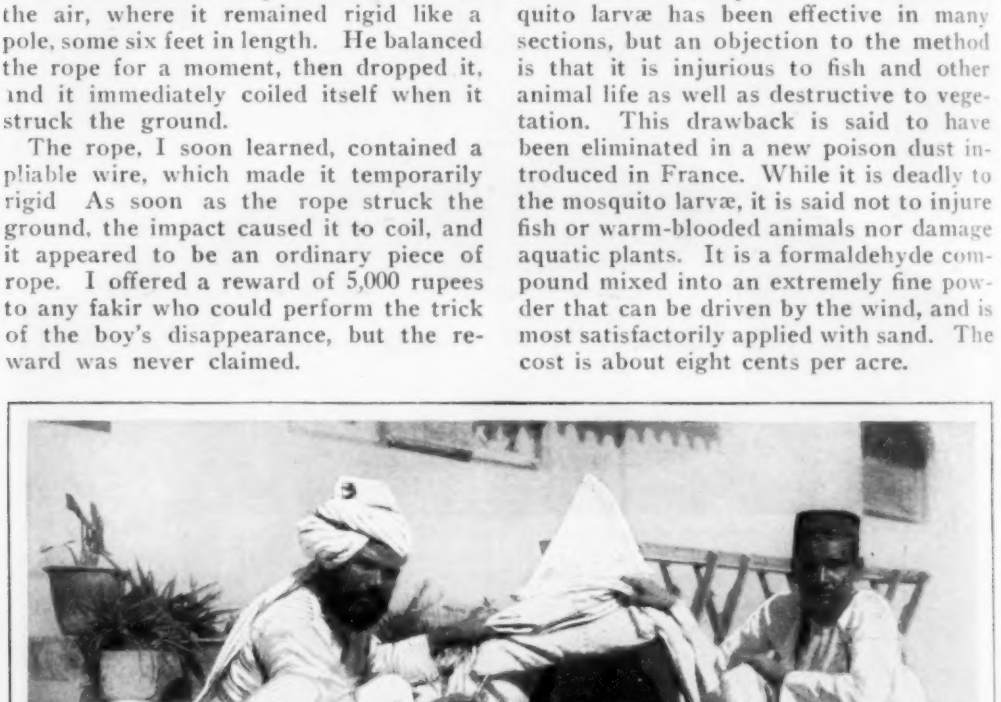
In the only trick of the kind I saw, the fakir took a coil of rope and tossed it in the air, where it remained rigid like a pole, some six feet in length. He balanced the rope for a moment, then dropped it, and it immediately coiled itself when it struck the ground.

The rope, I soon learned, contained a pliable wire, which made it temporarily rigid As soon as the rope struck the ground, the impact caused it to coil, and it appeared to be an ordinary piece of rope. I offered a reward of 5,000 rupees to any fakir who could perform the trick of the boy's disappearance, but the reward was never claimed.

Alleged explanations have been given of how the trick could be performed, but they are generally unsatisfactory and impracticable.. It has been suggested that the effect was created by hypnotic powers of the yogi. That might be possible, if only one witness were present, but in cases where several persons are said to have witnessed the trick, the theory cannot readily be accepted. Students of hypnotism have declared that "group hypnotism" is an impossibility.

POISON DUST KILLS MOSQUITO WITHOUT HURTING FISH

Spreading fine dust containing poison over marshes and ponds to kill the mosquito larvæ has been effective in many sections, but an objection to the method is that it is injurious to fish and other animal life as well as destructive to vegetation. This drawback is said to have been eliminated in a new poison dust introduced in France. While it is deadly to the mosquito larvæ, it is said not to injure fish or warm-blooded animals nor damage aquatic plants. It is a formaldehyde compound mixed into an extremely fine powder that can be driven by the wind, and is most satisfactorily applied with sand. The cost is about eight cents per acre.



Just After the Seed Has "Sprouted," One of the Steps in the Mango-Tree Trick; the Picture Shows the Multitude of Draperies Used to Hide the Various-Sized Plants until Needed

LOCUSTS DEFY HEAVY GUNFIRE ALONG TWENTY-MILE LINE

Giant locusts have been invading the countryside in India, three different swarms having descended upon territory in the Bombay presidency. One "army" was twenty miles long and thirty yards wide. When the insects had settled, heavy gunfire was directed upon them, but did not dislodge them, and several fertile tracts were devastated. Another swarm was five miles long and half a mile wide.

BOTH TUBES AND BATTERIES ELIMINATED IN SET

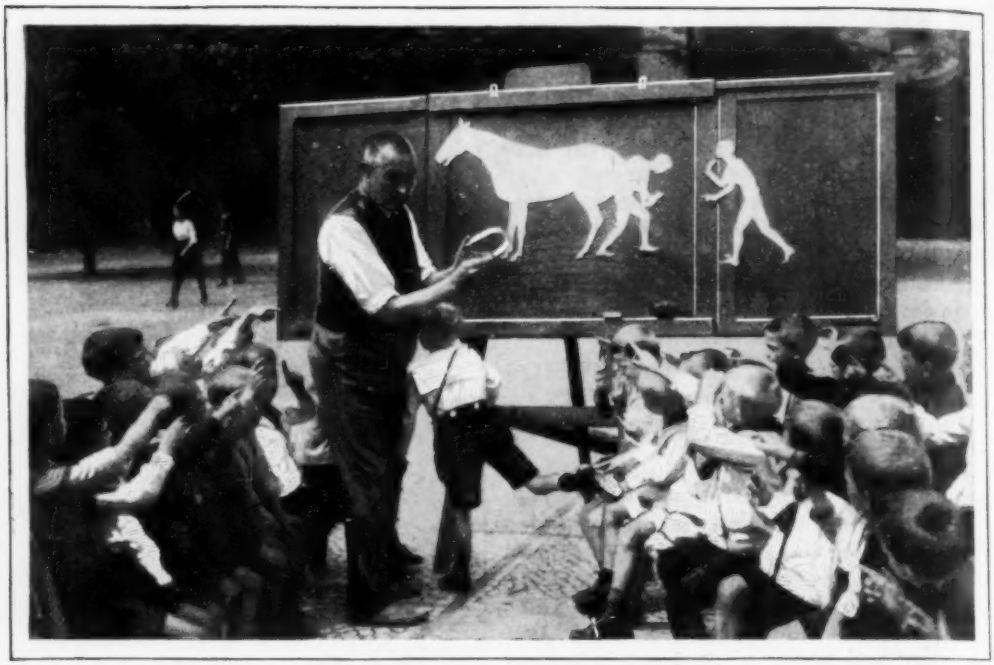
Hunting for a new method of changing electrical current from alternating to direct, Dr. Palmer H. Craig, of Mercer university, Macon, Ga., has accidentally stumbled on a discovery that, he claims, makes it possible to eliminate both tubes and batteries from radio, while retaining the efficiency and power of an eight-tube receiver. The Craig discovery, which bears no relation to any principle applied in crystal sets, involves the use of a pile of bismuth plates, protected from atmospheric corrosion by a coat of sulphur, and with a pick-up coil of insulated wire wound around them. In action, the pick-up coil responds to the radio signal, and the wave, passing through it, sets up an electrical effect in the pile of plates, which, according to Dr. Craig, may be used either as a detector or as an amplifier. The apparatus requires no current outside that in the radio waves for its operation. Rough laboratory experiments indicate that the device, as an amplifier, is four times as sensitive as an eight-tube receiver, while it is even better as a detector. In addition to being more sensitive than tube sets, it eliminates much of the distortion in such sets.

Dr. Craig with One of His Bismuth-Plate Radio Detectors, Weighing Less Than Half a Pound

Bookcases and Magazine Basket Assembled from Ready-Fitted Pieces and Decorated at Home

READY-TO-FIT FURNITURE ADDS FUN TO HOME DECORATING

Finding the right object to complete a scheme of room decoration is not always easy, since it is often impossible to obtain the exact color desired or a piece of the proper size. To aid the person who likes to be his own decorator, articles of furniture are available which can be easily put together in a few minutes and are of plain wood so that any scheme of decorating may be followed. A convenient bookcase and magazine basket have broad sides suited to painting by hand or being decorated with patterns cut from paper and varnished over. In order to still further facilitate the assembly, grooves are already made in the units so that the shelves and sides can be fitted together.



Where School Is Far from Dull; an Outdoor Trades Class in Blacksmithing; with Paper Models and a Willing Pupil as the "Horse," the Teacher Explains Important Points to Eager Listeners

TRADE TAUGHT BY BLACKBOARD AND PAPER MODELS

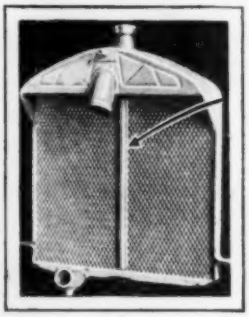
Young boys attending a trade school in Germany, receive interesting lessons in horseshoeing and other crafts from a series of blackboard lectures. The pupils are too small to do the actual work themselves, but they become familiar with the necessary steps by watching the process illustrated with models and drawings on the board. The figures are quickly adjusted to illustrate the correct positions. In one of the classes, a pupil poses as the horse, to make the lesson more graphic.

PASTURE PLANTS IN STRUGGLE FOR SURVIVAL

Pasture plants are in continual war to see which will prove fittest and survive, according to Dr. Herbert C. Hanson, associate professor of botany at Colorado agricultural college. Timothy, red-top, alsike clover and white clover cannot withstand the competition of orchard grass and red clover and will be crowded out if their enemies are not held in check, he has found. At the same time, however, Kentucky bluegrass, working under the shelter of the other plants and extending its subterranean foothold under their roots, eventually will drive out the victors. Smooth brome grass and meadow fescue often hold their own when cattle are barred.

SELF-THAWING AUTO RADIATOR REDUCES MOTOR ILLS

For quick thawing, an auto radiator is so arranged that when the water reaches the steaming point in the engine, heat and steam pour through small holes in the overflow pipe, starting circulation throughout the radiator. The core is of honeycomb design not likely to burst from freezing, and there is a cover strip over the perforated overflow pipe to prevent a draft through one column of air flues.



RULES FOR SAFE AIR TRAVEL ISSUED BY GOVERNMENT

Commercial aircraft engaged in carrying passengers or merchandise across state or territorial lines must be registered and licensed under regulations issued as the first step toward active governmental supervision of private aviation. Any aircraft flying across a state line, either on a commercial trip or to conduct commercial flying in another state, is required to carry the government license number, just as an automobile does. The aircraft, however, must first pass airworthiness tests to show that it is safe for flying. Other airplanes, not operated in traffic requiring licensing, are to be registered and carry the number allotted to them painted on the side. Pilots' and mechanics' licenses for commercial traffic also are to be issued by the government. Although the rules were effective the first of the year, they will not be rigidly enforced until July 1.

SKI RUNNERS PRACTICE INDOORS ON CHEMICAL SNOW

Slopes covered with chemical snow were arranged in a London department store so that ski runners could practice and demonstrate the essentials of the sport to beginners. The realism of the scene was increased by evergreen trees.

Depicting an Outdoor Sport in London Department Store; Ski Practice on a Slope Covered with Chemical Snow

© P. & A.
Fortune Cage at Spanish Lottery; Tickets Are Placed in This Huge Steel Ball for Drawing

PRIZES IN BIG LOTTERY TOTAL MILLIONS OF DOLLARS

Holders of lucky tickets at the annual Christmas lottery in Madrid win fortunes, for the total prizes amount to several million dollars. The tickets are placed in a special steel ball from which the winners are drawn.

VEST POCKET MOVIE PROJECTOR USES FLASHLIGHT BATTERY

Every man his own motion-picture show. This promises to become a reality as the result of a Swiss engineer's development of a tiny movie projector, not much larger than a cigaret case and using an ordinary pocket flashlight for illumination. If this fails, it is said that the machine can be adapted to use sunlight. The pictures can be displayed on a wall or any other convenient surface and, according to reports, are clear and steady. A special type of small film is used.

New Worlds in the Making

Morehouse's Comet, One of the Wanderers of the Sky Which Occasionally Flash across our Heavens and Then Disappear among the Distant Worlds Far Out in Limitless Space

HOW would you like to live on an earth that had eight moons wheeling around overhead?

Some day one of the neighbors in our universe—Jupiter—may support a race of people who will experience that unusual novelty. Jupiter, biggest of all the sun's planets, is now a world in the making and represents today what our earth was untold millions of years ago, just as our long-dead moon shows what this globe may be at some far distant date.

The eight big planets, of which the earth is one, and the hundreds of smaller ones, all revolving about the sun, form one of the most interesting groups in the heavens. Once there were nine planets, but at some time in the distant past one blew itself into thousands of pieces, and left a lot of little worlds trundling along in its place. The discovery of that long-lost accident, that probably occurred ages before the first man appeared on earth, is one of the most fascinating stories astronomy has ever produced.

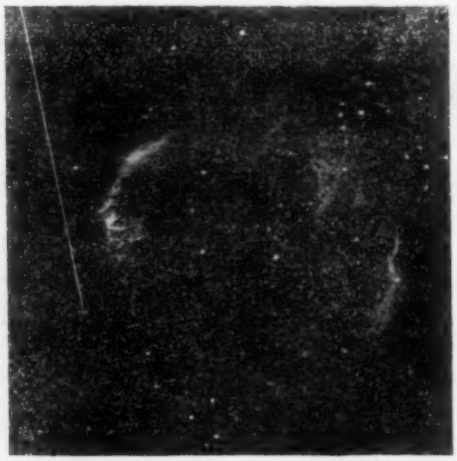
Johann Ebert Bode, who died in 1826, discovered that the sun's eight satellites were divided in two groups, four little ones, our earth, Mercury, Venus and Mars, then a long gap, followed by four big planets, Jupiter, Saturn, Uranus and Neptune. He wrote down their distances from the sun and was struck by the fact that the mileage seemed to increase in some mathematical ratio. From that observation, he evolved Bode's law, which says that if you add four to each figure in the series zero, three, six, twelve, twenty-four, forty-eight, ninety-six, etc., the result will represent the respective distances, in millions of miles, of each planet from the sun.

But after twenty-four, which represents Mars, there was a gap where the planet at forty-eight should have been. So astronomers decided that there must be a small and undiscovered planet there, and set about finding it. Pretty soon they did, but the elation had hardly died when somebody found another planet in the same place, and then another and another, until now more than 600 little ones have been listed, and the list is growing at the rate of about thirty a year. The answer

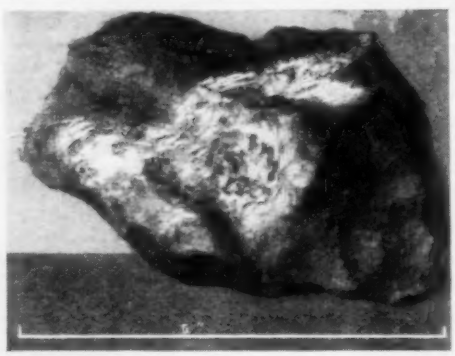
THE LUNAR ALPS ILLUMINATED BY THE EARTH

Courtesy Illustrated London News

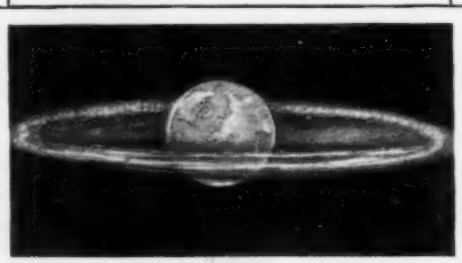
Plaster Model Showing Our Earth as It Would Appear from a Valley among the Alp Mountains of the Moon; for Lack of Air and Water to Errode Them, the Lunar Hills Remain as Rough as When Made



Frequently, While Astronomers Photograph the Distant Stars, a Meteor, Entering the Earth's Atmosphere, Burns Up, Making a Straight Streak across the Plate



Some Meteors Are So Large That Parts Survive to Reach the Earth; Above, a Fragment from Canyon Diablo, Arizona; It Is Almost Pure Iron



German Scientists Are Interested in a New Theory That Our Earth May Have a Luminous Ring like Saturn's, an Idea That Explains the Ghostly Zodiac Light

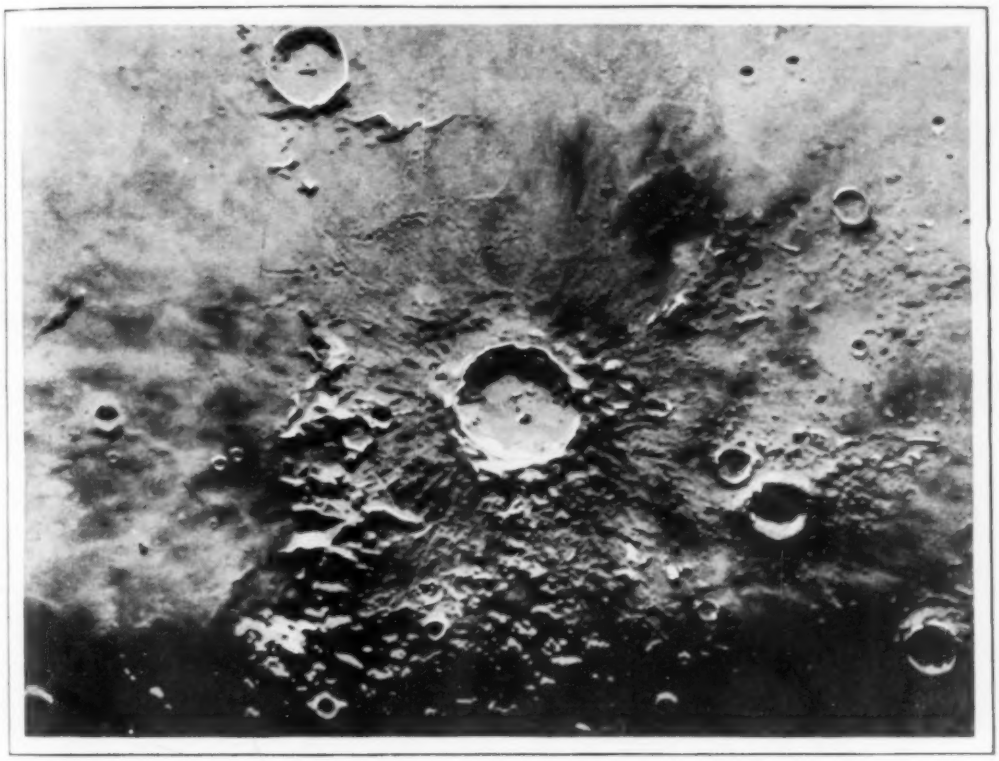
was that a big planet had broken up into innumerable small fragments, each of which continued to revolve around the sun in the neighborhood of their parent's old orbit.

If Jupiter, at some distant date, becomes inhabited, the possession of eight moons will not be the only distinction its people can boast, for their years will be as long as nearly twelve of ours—4,332.58 days to be exact. Jupiter is so much farther away from the sun, and its orbit so much bigger than the earth's, that it takes it correspondingly longer to complete a round trip.

The years grow progressively longer and the temperature progressively colder the farther you get away from the sun. If there is any place in our universe for human life to exist today, outside the earth, Venus or Mars would come nearest to it—the one merely being too hot and the other too cold to meet our ideas. Mars is nearly 142,000,000 miles from the sun, compared with our 93,000,000, and the result is an average temperature of ninety below zero at night, with daily changes to about sixty above. The average temperature of Venus is 165 degrees, because it is nearer the sun.

Once you pass Mars on the outward trip from the sun, the distances become truly immense. Jupiter, the first big planet past the gap where the ninth one once was, is nearly 484,000,000 miles away, and has an average temperature of 305 degrees below zero, and that's the chief reason why there may never be people there to enjoy the bright moonlight under its eight moons. Jupiter, though, with a diameter nearly eleven times that of our earth, rests secure with the record of being the biggest of the planets. Saturn, the planet with the queer rings and the ten moons, is almost as big. Uranus is a medium-sized fellow that would only require four or five of our earths to span, and at the outer edge is Neptune, a mere 29,827 miles in diameter, temperature 446 degrees below zero—and a year of 60,187.65 days. In other words, it would take the combined lifetimes of two people over 82 earth-years old to live one year on Neptune!

Our moon, being so close to us, is the best-known object in the sky, and, as it has no vapor to hide its features, the study of its surface has given an accurate idea of what the eventual fate of all celestial



The Crater Theophilus on the Moon Is the Central Depression; the Vast Hole Is 18,000 Feet Deep, and the Central Mountain, Which Casts the Black Shadow, Stands 10,000 Feet High

wanderers may be. The most curious feature of the moon is the way its surface is pitted with giant craters, many of them miles across and often 20,000 feet or more in depth. A lofty wall of earth and rock thrown up around the edge adds to the depth of the valleys, which sometimes have in their center a mountain nearly as high as the surrounding rim. Scientists have long believed that the craters are probably the marks of some long-ago bombardment of the moon by huge meteors. Millions of meteors every year come within the earth's attraction, but comparatively few actually strike. Traveling at tremendous velocity, they are heated to incandescence by friction with the air as soon as they enter it, and are burned up, as a rule, before they can reach the earth. They are familiar as "falling stars." But when a meteor gets too near the moon and is drawn to it, there is no atmosphere to burn it up, so the mass strikes the moon with full force.

Mars and Jupiter, of all the planets, hold the most interest for the earth—the one because it may possibly harbor living creatures, and the other because of its size, because it is a world in the making which can be studied to learn what our own earth once was like, and because, next to Venus, it is normally the most brilliant of all the planets, easily visible to the naked eye.

Mars is a dying planet, growing colder and colder, until some day it may be as dead and lifeless as our moon. The telescope shows Jupiter as a rapidly rotating globe of gases and vapors. There can be no thought of life, for a surface, in the sense of a solid crust like that of the earth, does not exist. It is believed to be a vast semifluid core surrounded by dense vapors, which in billions of years may evolve into a solid planet.

Some idea of the comparative size of the two, Jupiter and Mars, is gained from the fact that one of Jupiter's eight moons, Ganymede, is almost as big as the red planet. From Jupiter's great bulk some 1,300 worlds the size of our earth could be made. Four of its satellites equal or surpass our own moon in size.

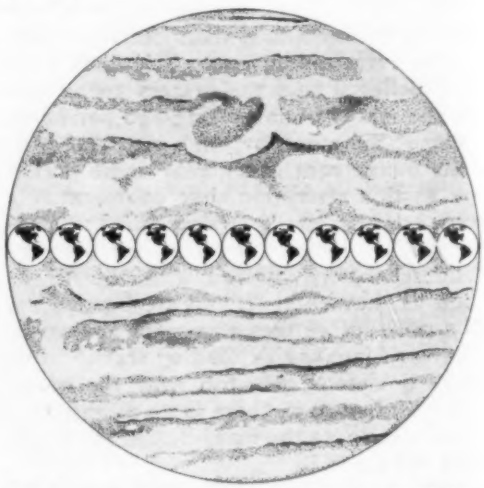
The "Man in the Moon," When Examined at Close Range, Becomes Mountains, Craters and Plains, Erroneously Named "Seas"

One of the curious features of Jupiter, as odd as Saturn's rings or Mars' canals, are the belts, light and dark and many in number, that lie parallel to its equator and seem to be formed of denser vapors than the rest. Two semi-permanent markings appeared on the planet long ago, and have been carefully watched for years. One is called the Great Red Spot and the other the South Tropical Disturbance. The red spot was an oval formation 30,000 miles in length and 7,000 miles wide, first observed in 1871. At first a pale pink, it soon deepened to brick-red, then faded to pink again and gradually almost disappeared, leaving an oval white notch. It drifted around like other cloud formations, but seemed to offer an obstacle to smaller disturbances, turning them aside like an island in the sea.

The South Tropical Disturbance appeared within the last twenty years, grew to four times the size of the red spot, and appears as a dark area terminating in bright, white loops at either end. Sometimes the two areas come in conjunction, and then the latter disappears for a time, only to form again. Some scientists believe the two spots mark the first efforts of the planet to form a solid crust, and others hold the idea they may portend the birth of another satellite, which Jupiter may be trying to expel from its swirling mass.

The story of these changes, reflecting as they do our own origin, and the observation of the moon as a long-dead world, give the beginning and the end of existence, with our earth midway between the two extremes. From them it may be possible to learn how we originated, and how we finally may disappear.

Yet science is far from satisfied by the knowledge that has been learned from the moon. There is still the problem of the craters to be solved, the problem of the vast sealike plains, and the mystery of the long white lines that radiate for hundreds of miles from Tycho. They look like mighty ice cracks, but, lacking water, there could be no ice on the moon, so some other explanation must be found.



Our Earth Is a Tiny Thing Compared with Jupiter, Also a Satellite of the Sun

POLICE LABORATORY ON WHEELS TO CURB CRIME

German Police Squad with Traveling Laboratory at the Scene of a Crime; besides the Camera, the Outfit Includes Chemicals for Making Analyses, Microscopes and Other Equipment

Enabling detectives to obtain evidence fresh from the scene of a crime, an auto, equipped as a laboratory, has proved of aid in Germany. It carries a searchlight, camera, collapsible table and chairs, medical cabinet and other apparatus. Arrived at the spot, the police can set up their equipment, take photographs, make measurements and obtain other data for complete analysis while on the scene, without making repeated trips back to headquarters with consequent loss of time.

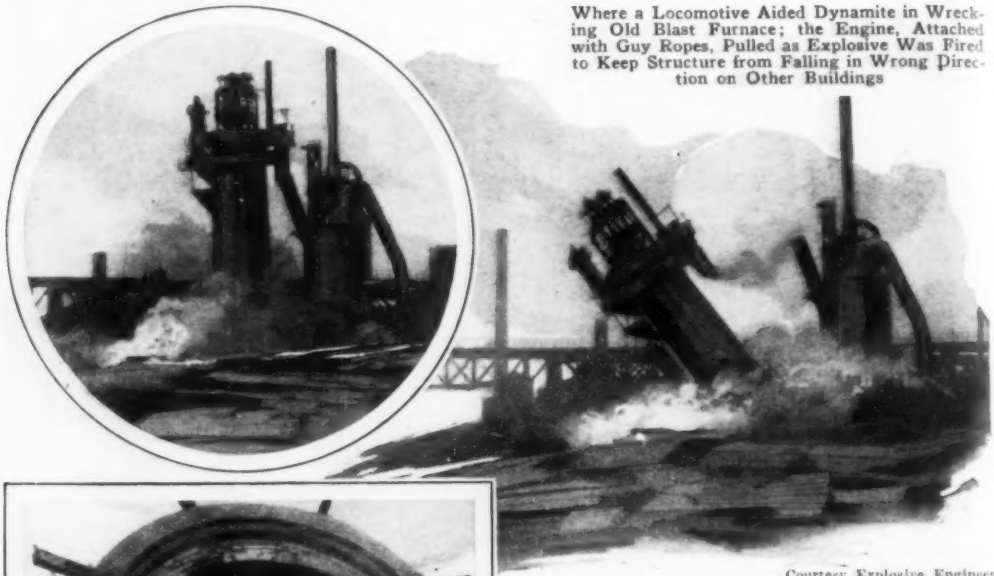
SLIDING BOX FOR SMALL AUTO GIVES TRUCK SERVICE

Small coupes or roadsters are quickly converted into serviceable carriers for packages, tools and other articles, by means of a sliding box which can be pulled out at the rear and then pushed in and concealed when not in use. It is strongly made of steel, slides on a sleeve frame capable of holding a heavy load, and when opened to extreme length, is sixty inches long with a width of thirty-three inches. To install the box, it is only necessary to remove the rear lower-deck panel and fasten the carrying frame to fender bolts and the flooring on either side.

HUGE CONCRETE MIXER RESULT OF STRICT STATE LAW

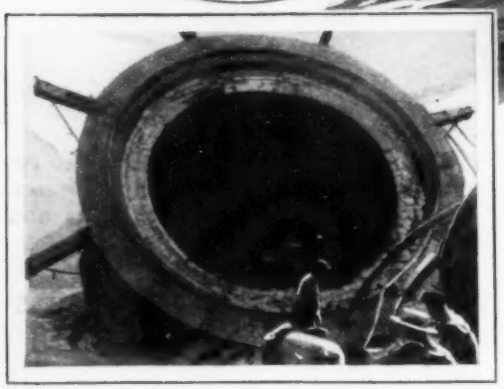
Out of the provision in the law of a southern state requiring that concrete be stirred a minute and a half before it can be poured into road forms, has developed a huge mixer, said to be one of the largest in the world. In most states, the mixture can be poured after only one minute of stirring. Because of the extra time required, the mammoth apparatus was developed to make up for loss that would have been suffered with ordinary equipment. The outfit is practically a double mixer, consisting of two engines, two drums, two booms and buckets and two intake hoppers. It travels on a single chassis on one pair of crawler treads. Three cranes are required to supply it with materials as well as twelve seven-ton and one four-ton gasoline locomotives and 140 narrow-gauge cars. It dumps thirty-two cubic feet of concrete on the roadbed every minute. During the building season in 1926, thirty miles of eighteen-foot pavement were laid with it.

FELLING BLAST FURNACE TESTS ENGINEERING SKILL



Where a Locomotive Aided Dynamite in Wrecking Old Blast Furnace; the Engine, Attached with Guy Ropes, Pulled as Explosive Was Fired to Keep Structure from Falling in Wrong Direction on Other Buildings

Courtesy Explosive Engineer



Much engineering skill was involved in the removal of an obsolete blast furnace at the Pittsburgh plant of the American Steel and Wire company. The furnace was 108 feet high and had a maximum diameter of thirty-five feet. One problem was to make sure that the towering structure would fall in the right direction, away from other buildings near at hand. This was solved by using guy ropes, attached to the top and tightened by a slowly moving yard locomotive, pulling in the direction of the desired fall at the moment of the discharge of the dynamite cartridges used for blasting the structure. This plan caused the tower to fall exactly as desired. The explosives were blanketed by bags of sand.

SUPER-OYSTER SOLVES PROBLEM OF IMPROVING ITS RACE

How scientists have finally solved the age-old problem of mating the oyster in captivity, rearing its young and, by selective breeding, improving the racial strain is one of the latest triumphs of the modern laboratory that promises to add millions of dollars to the income of the Atlantic coast states. Dr. William F. Wells, of the New York State conservation commission, solved the problem which had perplexed scientists for generations. The trouble had been that the oyster eggs were so small that they passed through the filters used to purify the water in which they were kept, and if the water was not purified, they died. Dr. Wells found the solution in putting the eggs into a centrifuge built like an ordinary cream separator. The eggs were thrown outward and adhered to the sides of the machine, while the stale water was drawn off and fresh water added each day. In this way the eggs were hatched and young oysters grown in captivity. In seeking crosses to improve the strain Dr. Wells developed a breed of oysters without the anchor by which they usually attach themselves to some rock. Such oysters occur as freaks in nature and

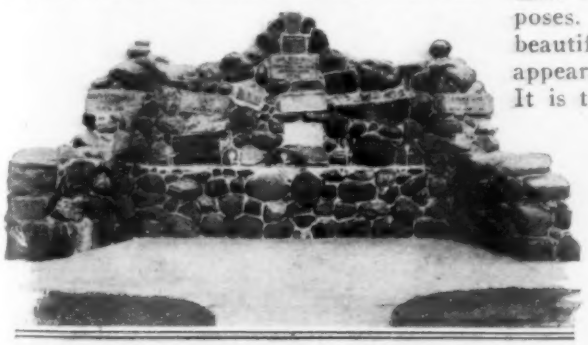
soon die, but by raising them for a year in his ponds before throwing them into the sea, he obtained oysters that were able to shift for themselves and grow to maturity. Unlike the usual oyster, whose shell is misshapen and gnarled from conforming itself to the cleft of rock in which it grows, the new type oysters have symmetrical shells, regularly marked.

PLANT STEAM SIGNAL WHISTLE ELECTRICALLY CONTROLLED

To summon employes of a refinery plant to the telephone, an electrically operated steam whistle sounds long and short blasts in a code, a different signal being given for each man. The impulses governing the whistle originate in a small telephone-type switchboard which is connected to a magnetic switch. The signal is repeated continuously until the person summoned reports through the switchboard. In spite of changes in temperature and storms, the system has functioned efficiently, according to reports, the valve having been operated more than 1,500,000 times since it was installed about a year and a half ago.

STONES FROM ALL THE STATES IN MEMORIAL FOUNTAIN

Legion posts in every state of the union, and several abroad, sent stones for the construction of a memorial fountain to fallen war heroes at Mt. Morris, Ill. In all, 250 were obtained and built into the memorial by former service men. Each stone has the name of the donor engraved upon it.



Tributes from Every State and Several Countries Abroad Are Included in This American-Legion Fountain of Many Stones

Using Rouge Stick from Tidy Package; Right Quantity Is More Easily Applied

SANITARY LIPSTICK IN PACKAGE LATEST BEAUTY AID

Individual lipsticks, held in a paper carrier like a match package, have been introduced for the woman who is interested in absolute cleanliness as well as beauty. There is enough rouge on each stick for a single application, after which it may be thrown away. The package is conveniently carried in the handbag.

LEATHER FROM THE SEA

There are a number of fish that produce serviceable leather for many purposes. The shark yields leather of a beautiful gray or blue color and has the appearance of the finest-grained material. It is tough but easy to work. In some respects, it is said to be superior to ordinary hides. Sturgeons furnish a tough leather often used for lacing belts together. In bygone days, shoes and gloves were manufactured from the skin of the cod, and the same use is being made of the skin of other fishes in a number of places in Europe today. Eelskin is employed for bookbindings and for whip braiding. The skin of the garfish can be polished until it resembles ivory and is utilized in making jewel cases, etc.

MOORISH ARCHITECTURE USED IN MEXICAN CHURCH

Black-and-White Tile Work with Deep Window Embrasures, Reminiscent of the Moorish Palaces of Old Spain, Set Off the Carved Front of the Sanctuary of Ocotlan, Tlaxcala, Mexico

CATHODE RAYS DRAW RUBBER FROM LEAVES OF PLANT

Discovery of a powerful cathode ray by Dr. W. D. Coolidge, of the General Electric company, was followed almost on the day of the announcement, by the question, "What is it good for?" An answer to the query is already suggested by the result of an interesting experiment with the rays on rubber leaves. They were directed from a distance of about an inch upon a leaf of a rubber plant. Within a few seconds after the bombardment of the high-speed electrons issuing from the tube, there was a marked flow of latex, or sap. This has inspired the vision of a rubber plantation with a maze of poles, wires and tubes, the sap being "milked" from the leaves instead of gathered from cuttings in the trunks, as is now the practice. While authorities do not believe that the ray seriously threatens to change the rubber-harvesting methods of the present, they do anticipate that it may have an important part to play in chemical and other experiments on rubber, particularly in vulcanization. The rays already are known to possess properties that have peculiar effects on certain gases.

CLOCK WITH TEN HANDS TELLS TIME IN ALL LANDS

Travelers are spared the difficulty of making time calculations at one of the railway stations in Berlin, as the big clock there has ten hands which show the correct time for as many places throughout the world. The dial is divided into the twenty-four hours for the day and night together, and the hands are marked with the names of the places for which they tell the time.

World Clock in Berlin Railway Station; a Glance at Dial Shows Time in Ten Cities

In the "China" Closet of a Motion-Picture Studio; Storing the Plaster of Paris Crockery

CROCKERY IN MOVIES IS MADE ONLY TO BE BROKEN

When the movie comedian breaks a dish over the villain's head, everyone knows that the "china" is a clever imitation of the real article, but few persons realize how thin and fragile the fake crockery is. Made of plaster of paris and painted to resemble genuine pieces, the vases, bottles and other things range from an eighth to one-sixty-fourth of an inch in thickness. This "break-away" stuff is kept in large quantities in almost all the studios, and much of it is so flimsy that a small fraction of all that is made reaches the set without damage. It is used with almost perfect safety, the only danger being that occasionally the base of a piece will become heavy enough to register a more serious shock if it is swung with sufficient force.

C. E. Mirguet beside Giant Flipper of a Whale Pieced Together for Display as a Museum Specimen

ARTIST BUILDS HUGE WHALES OF BONE AND PLASTER

Fashioning a whale as big as a freight car, or modeling other creatures almost as large, is all in the year's work for C. E. Mirguet, a taxidermist at the national museum. For more than thirty years he has made a specialty of constructing and mounting, in lifelike manner, jungle and sea creatures for museum cases.

FROZEN ORANGES DETECTED IN TROUGH OF WATER

Telling a frozen orange or lemon from a good one is a difficult task, for as the fruit does not fall to the ground after being nipped, there is little or no change on the surface unless the freezing has been very severe, and testing by cutting, of course, ruins it. To simplify the task and to prevent shipping frozen oranges and lemons, a grower devised a "detective" in the form of a long, deep trough filled about two-thirds full of water, which is allowed to flow slowly toward one end. The fruit to be tested are dropped, one at a time, from a chute into the water. Any frost-bitten ones, being lighter than the sound fruit, bob up more quickly and are caught on screens arranged horizontally in the trough below the water line. The good fruit sink farther, rise more slowly and are caught by other screens. In this way the unfit product is removed and the remainder is graded.

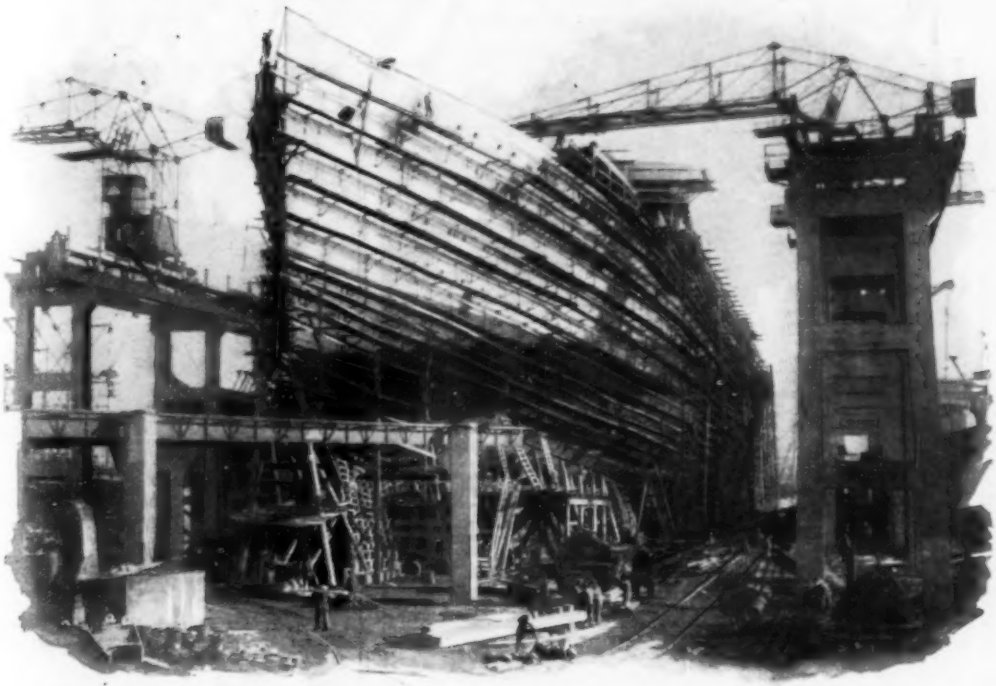
LOCOMOTIVE WHISTLES COSTLY

At least $8,000,000 is spent yearly by the railways of the United States in blowing the locomotive whistles, according to estimates. Each hour of continuous use for one whistle consumes about four tons of water and 1,200 pounds of coal. Suggestions have been made that the whistle be moved ahead of the smokestack, so that its sound would be deflected much less, and that it be constructed to give a high-pitched note which would have a longer range of audibility.

FRONT AND REAR AUTO SIGNALS REDUCE ACCIDENTS

Warning is given at the rear and at the front of the auto simultaneously for stops and turns by a set of signals operated from a switch at the steering post. They are intended to dispense with the giving of arm signals and can be seen plainly at a distance of 200 feet. Stop and left signs show in red and right is given in green. Since the warning is given before the turn is made, there is less danger of mishaps.

Turning Signs in Front, Sides and Rear of This Car Are Intended to Prevent Accidents



Shortly before the Launching, the Giant Hull of the Steamer "Vulcania," on the Ways at Monfalcone, Italy; Special Steel of High Elastic Properties Was Used in Constructing the Boat

OCEAN LINER WITH NINE DECKS BUILT OF ELASTIC STEEL

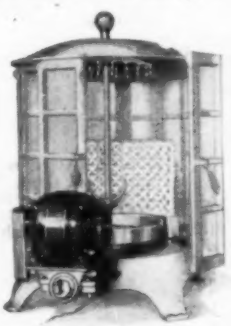
The upper parts of the liner "Vulcania," recently launched at Monfalcone, Italy, are constructed of a special steel, which is said to have high elastic qualities, specially suited to ocean service. The boat has a gross tonnage of 24,000 tons, is 631 feet long, seventy-nine and one-half feet wide and has nine decks.

RANGERS READ SNOW METERS THROUGH TELESCOPES

Farmers and others interested in the water conditions for irrigating California lands, consider the depth of snow that falls in the Sierra mountains during the winter an important factor in their calculations. Information concerning the snow is furnished by forest rangers. At one station, a two-day journey through drifts and difficult ground was necessary to scale a peak, make observations and return. To eliminate these trips, a snow meter has been installed on the peak. It consists of a standard marked with cross arms and notches. From the ranger station, eleven miles away, the gauge can be plainly read with the aid of a powerful telescope. By counting the number of notches not covered by the snow, the observers can compute the depth of the snow without leaving their shelter.

BARBECUE ROASTER FOR STORE FITS ON COUNTER

Suitable for the drug store, restaurant or sandwich shop, a small barbecue roaster occupies only thirty inches of counter space. It is provided with a pump which lifts the drippings from the meat to the top of a revolving axle, around which the contents are placed, and discharges them over the meat. Pork, beef, fish or fowls may be prepared in this outfit.



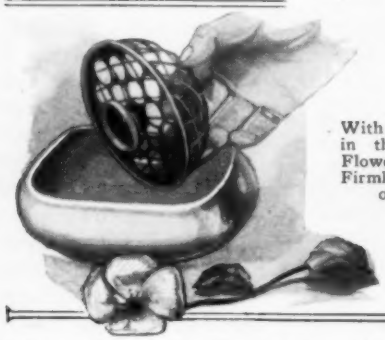
NEW WAYS *to avoid*

Affording Fresh Air without Opening the Windows a Ventilator Unit Is Easily Installed and Raised with a Chain; It Is Adaptable to Plain or Fancy Glass

Rubber Mat beneath Flowerpot Protects Varnished Surfaces; Ridges Permit Ventilation

Pan with Permanent Strainer Lid Has Handle That Keeps Cool

Both Sides of the Knife Are Sharpened at Once between Small Disks Rotated by Crank



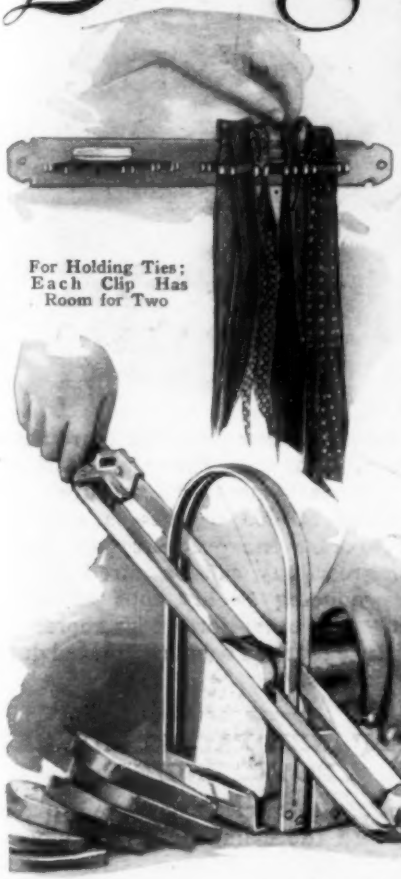
With a Vacuum Cup in the Base, This Flower Holder Sticks Firmly to the Bottom of the Dish

Pits Pop Out of Dates Quickly and without Damaging the Fruit When This Instrument Is Used

Anyone wishing further information on devices described in the editorial pages can

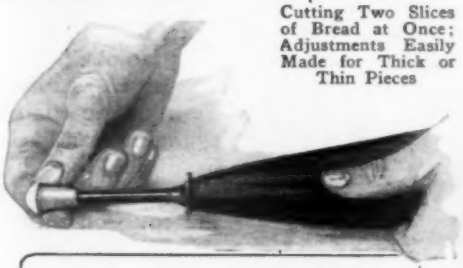
HOME *Drudgery*

Portable Wardrobe Keeps Garments Free from Dust and Moths; Sides Lock by Pulling Small Tab; Holder Is Screwed to Wall



For Holding Ties; Each Clip Has Room for Two

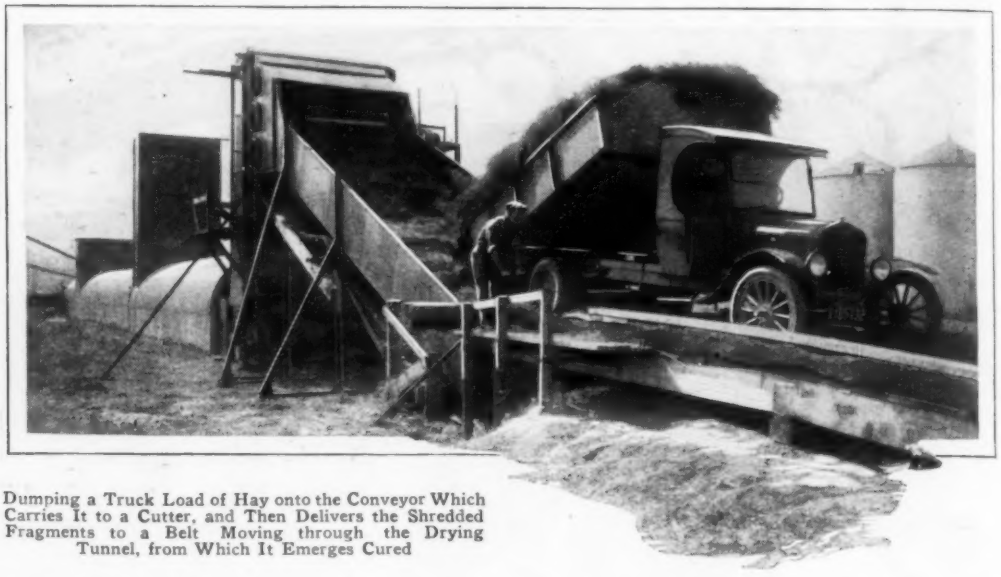
Cutting Two Slices of Bread at Once; Adjustments Easily Made for Thick or Thin Pieces



Rubber Tip for Umbrella Prevents Slipping in Any Location; It Also Protects Eyes of Others

Combination Water Heater and Cooker Fits Oil, Gas or Electric Stove

MAKING HAY WHILE IT RAINS IS POSSIBLE NOW

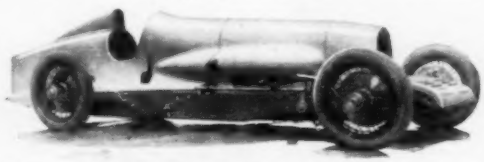


Dumping a Truck Load of Hay onto the Conveyor Which Carries It to a Cutter, and Then Delivers the Shredded Fragments to a Belt Moving through the Drying Tunnel, from Which It Emerges Cured

The best-known farm saying—make hay while the sun is shining—may be banished as a result of the development of successful apparatus to artificially cure green hay, even in a pouring rain. The hay curer makes it possible to save the crop in regions where excessive rainfall during the mowing season prevented curing the grass, so that it was only useful in the meadow. The apparatus is not only a drier, but includes all the equipment, from a special mowing machine to the power grinder that reduces the cured grass to a coarse meal ready to be blown into the silo for storage. The gasoline-driven mower differs from the usual type in that it not only cuts the hay off near the ground, but also cuts it up in twelve-inch lengths, and delivers them into a motor truck driving alongside. From the truck the grass passes onto a conveyor, running through a low steel shed, 160 feet in length and twelve feet wide. Midway between the ends of the curing shed is a furnace to generate the curing heat, while big electric fans circulate the warm air through the grass on the belt below. Moving five feet a minute, it takes the hay but little more than half an hour to pass through the shed, but only twenty minutes' exposure to a temperature of 400 degrees is actually needed to cure the greenest hay. Sixty tons of green hay can be cured in ten hours, producing twenty tons of dried product. The other forty tons represent the moisture that has been evaporated during the process.

STREAMLINED RACING CAR HAS A NOVEL ENGINE

Mounting a twelve-cylinder airplane engine, with the cylinders cast in blocks of four, necessitating special streamlined bulges on either side of the hood to cover them, a new racing car, built in England by Capt. Malcolm Campbell, embodies a number of unusual features. Four of the engine cylinders stand vertically under the main hood, while the four on either side, projecting at an angle of sixty degrees, fit into the side hoods, through which their short exhaust pipes project. The front axle of the car is more than eight inches long-

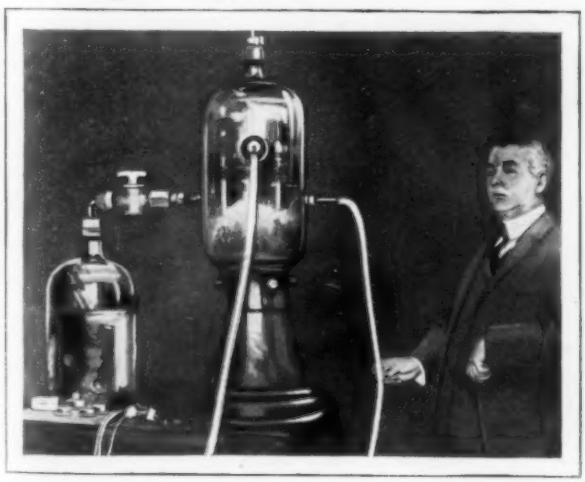


New Twelve-Cylinder Racing Car, Showing the Streamlined Side Bulges on the Hood

er than the rear one, the front wheels having a track of about five and a half feet. The body is so far underslung under the rear axle, that rear tires two inches larger than those in front are used. Developing slightly over 500 horsepower, the engine is extremely light for its size, weighing only 915 pounds.

POWER FROM OCEAN WARMTH TO PRODUCE ELECTRICITY?

Two French inventors are authors of a plan for utilizing the warmth of surface water on tropic seas and the coldness of the deep waters below to furnish power. A basis for the idea is the fact that warm water can be made to boil by reducing the pressure on its surface. The inventors propose to adapt this principle to a gigantic ocean-power plant in some favorable tropic locality. The warm surface water, which, in many such regions, stays at an average temperature of twenty-six or thirty degrees Centigrade the year around, would be placed in a sort of boiler, atmospheric pressure removed and the consequent steam utilized to turn a turbine before being condensed by cold water from the depths. According to reports, a test outfit used to demonstrate the idea, furnished enough power to light three small electric lamps for eight or ten minutes. Critics declare, however, that such a plant would have to be too large to be practical.



© Herbert Photos

Test Apparatus Which Produced Steam to Run Turbine and Light Small Electric Lamps for a Few Minutes

Window Telescope in Use; Figures Seen Are Those of Three at Left of Glass

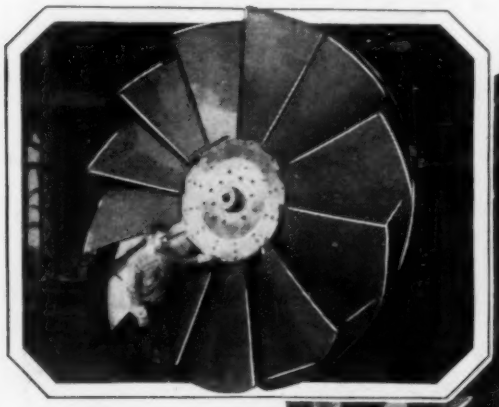
TELESCOPE LENS ON WINDOW GIVES CLOSER VIEW

Hung in the window, a lens serves as a telescope, bringing distant objects within close range of vision. It is proving popular for country homes, and the supporting bracket obstructs the glass but little.

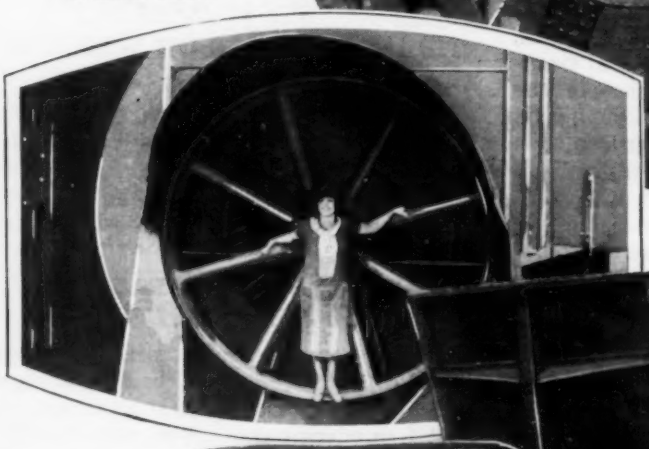
ABOVE-GROUND STORAGE BEST TO KEEP APPLES

An above-ground cellar, with floor and walls of earth proved a better storage place for apples than either an underground cellar, with similar floor and walls, or a cork-lined storage cellar, according to experiments made by Dr. L. M. Marble, of the American Society of horticultural science. He found that the above-ground storeroom, with its floor at the same level as the surrounding earth, maintained a higher humidity throughout the storage season, and therefore there was less loss in weight of the stored fruit. The tests showed that the higher the humidity was kept, the more moisture the fruit would absorb from the air, and the longer it would remain in such condition as to be fit for sale.

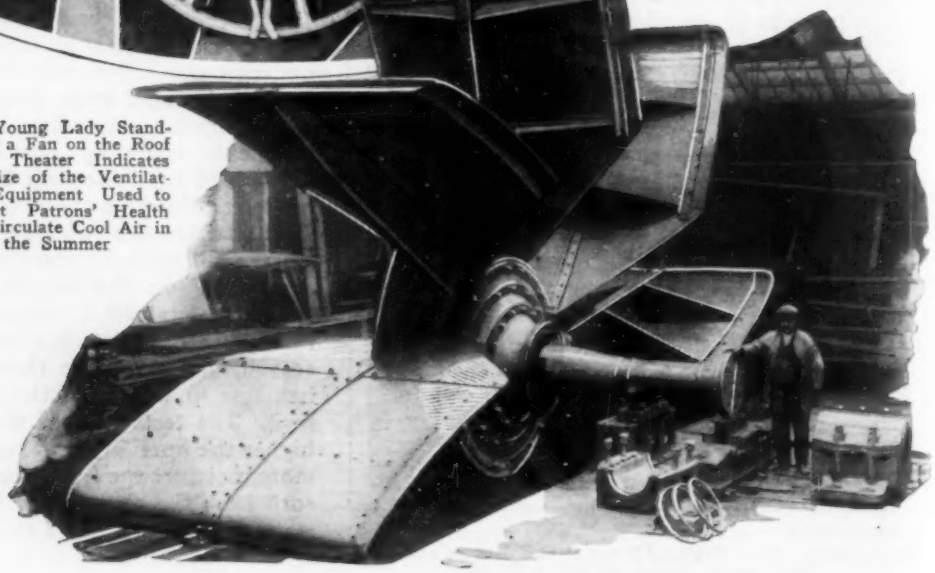
GIANT FANS WHICH SAFEGUARD HEALTH AND LIFE



Blower of a Giant Theater Fan, of Which Thousands Are Built to Protect the Health of Patrons in Crowded Movie Houses



Part of a Fan Capable of Pumping Twenty-Five Tons of Air a Minute, Built for a South African Coal Mine, Is Shown Above, and Below Is Its Huge Rotor Being Assembled Previous to Factory Test



The Young Lady Standing in a Fan on the Roof of a Theater Indicates the Size of the Ventilating Equipment Used to Protect Patrons' Health and Circulate Cool Air in the Summer

HEAVEN PICTURED AS MAN'S IDEAL ENVIRONMENT

That primitive man's concept of heaven or of a place of abode for the hereafter differs with every race and clime, but always represents the opposite of the ills its holder faced on earth, was demonstrated at the recent convention of the American Association for the Advancement of Science by George T. Renner, Jr., of Columbia university. The tropical-forest resident, he explained, pictured heaven as a remote village in a land of inactivity, with no heat or mosquitoes, while the Eskimo placed heaven in the center of the warm earth and hell up in the cold sky. The Comanche Indian pictured heaven as a prairie full of buffalo, where the hunter never would want for meat, while the more domesticated Todas imagined it as a land of pastures and dairies. Heaven to the ancient Hebrew was a walled city on a hill, protected from the ravages of desert nomads, while the Mohammedan pictures it as a delightful, well-watered oasis and imagines hell to be a scorching place with hot desert winds. Invariably man created his picture of the hereafter by trying to minimize the evils and emphasize the good on earth.

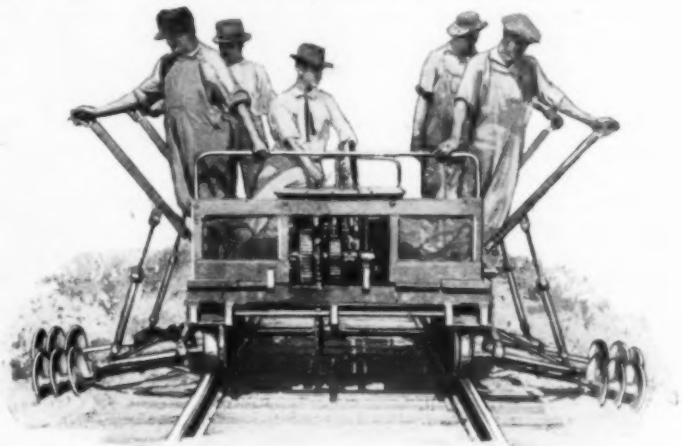
DISK WEEDER FOR RAILROAD KEEPS BALLAST IN SHAPE

To keep the railroad right of way free from weeds between the ends of the ties and the grass, a car has been adapted with considerable success. There are four sets of disks, with a man to operate each and another man to run the car. The shafts can be set at various angles and distances from the track, to reach weeds growing anywhere within the area covered on each side of the track. Besides cutting out the undesirable growth, the disks prevent the ballast from being scattered and keep it shaped to the desired profile.

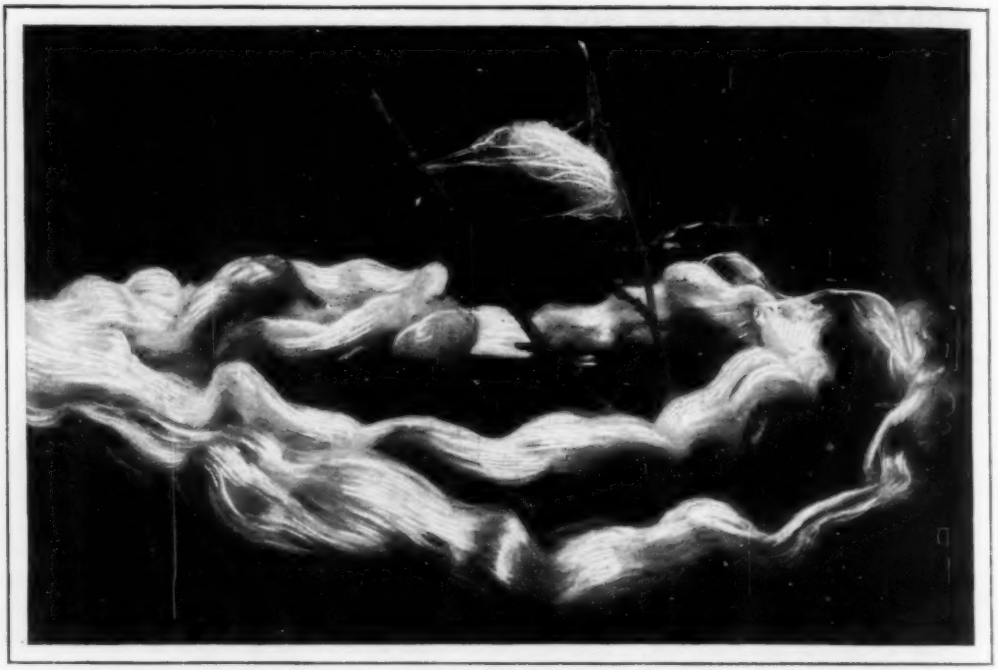
Enjoying a Motion-Picture Show While Waiting for Train; the Cabinet and Screen

FREE MOVIES IN RAIL STATION HELP PASS TIME

Passengers waiting for trains at the Northwestern station in Chicago are entertained by motion pictures displayed in an electrically operated cabinet. The film is projected upon a screen at the top of the box and is automatically adjusted for another showing when it has been run through once. An attendant is not needed. The pictures are of instructive as well as amusing nature, enabling persons to improve their waiting time.



Disk Weeder and Ballast Shaper in Operation on Railroad; the Cutters Are Adjustable to Different Angles and Lengths



One Silkworm Cocoon and the Silk It Contained; Silk Gowns and the Transparent Fishing-Line Leaders Come from the Same Source, but Are Produced by a Different Process

Robbing the Silkworm to Snare Fish

How Busy Little Creatures Supply Human Needs from Dresses to Fine Trout Lines

A SILK dress or a fishing line—the silkworm has no preference one way or the other. Left to itself, it will produce the material for the gown, but it also readily supplies the strong line used by the fisherman in casting for trout.

The silk gut of the fishing outfit is merely silk in its initial stage. When the worm approaches maturity, it develops two channels running along the sides of its body. In these ducts there is collected a sticky fluid which will harden into a solid mass if exposed to the air. This is the material which becomes silk gut when extracted before the worm begins to convert it into silk.

The process of producing the line is simple, and consists in killing the worm and soaking the body in strong acetic acid until the gland walls can be removed. The fluid is then drawn out into the form of a fine line, which is stretched between two pins at the ends of a board and left there to dry. The action of the sunlight causes the material to harden into a semblance of gut, producing a line of extreme strength, lightness and flexibility. An additional property is its almost complete transparency in water, which gives it special value to the sportsman engaged in snaring the wary trout.

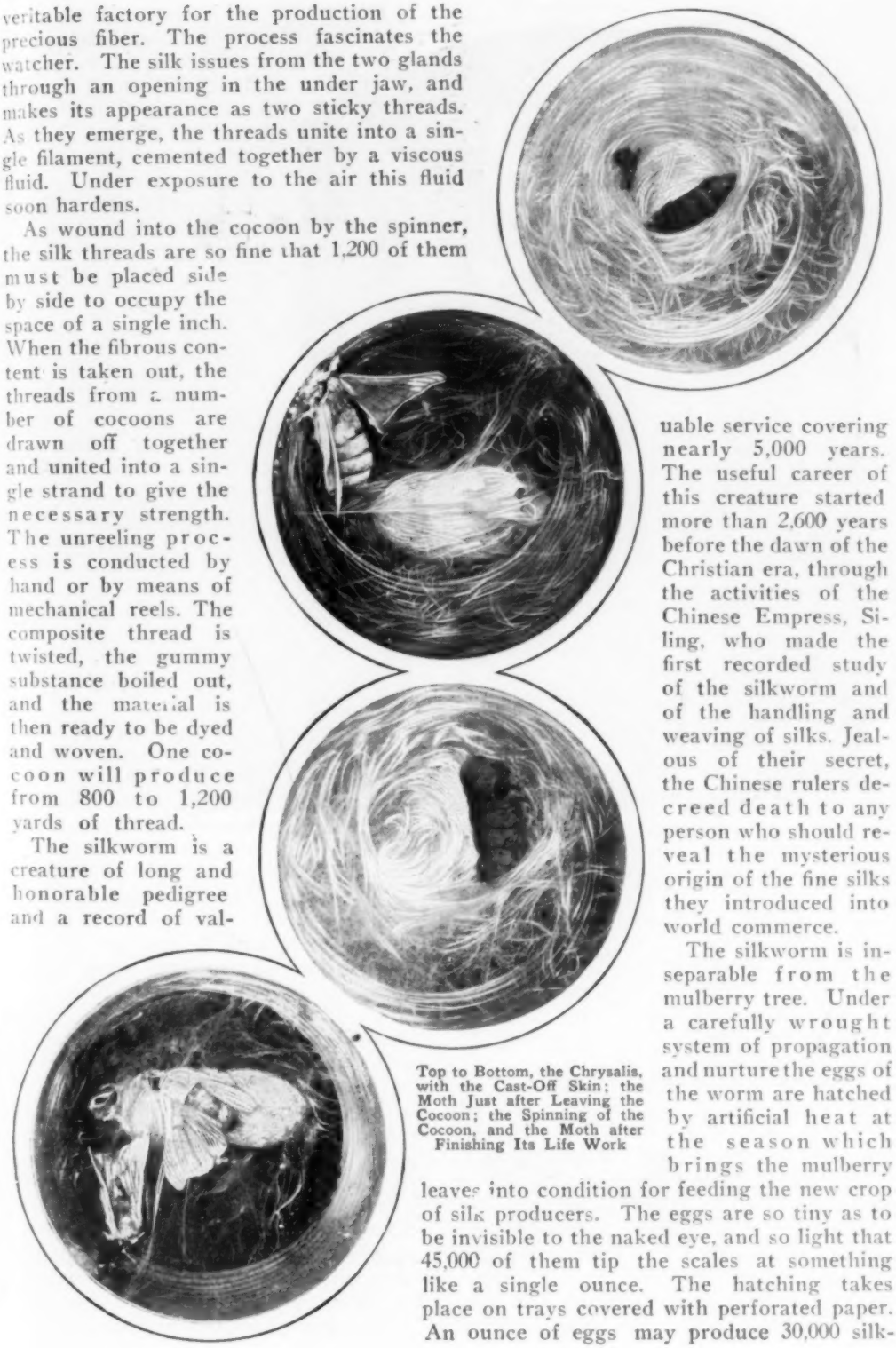
Allowed to proceed without interruption, the worm converts the sticky content of the two ducts into the silk fiber of general commerce. Normal development causes the silk glands to become so filled that their pressure makes it impossible for the worm to eat, and starts it on a restless ramble along the branches of the mulberry tree which is its home. In this journey the worm waves its sightless head in the air, seeking twigs to support the filaments about to be disgorged.

The silk growers leave nothing to chance, and the twigs are ready and waiting in a framework which constitutes a

veritable factory for the production of the precious fiber. The process fascinates the watcher. The silk issues from the two glands through an opening in the under jaw, and makes its appearance as two sticky threads. As they emerge, the threads unite into a single filament, cemented together by a viscous fluid. Under exposure to the air this fluid soon hardens.

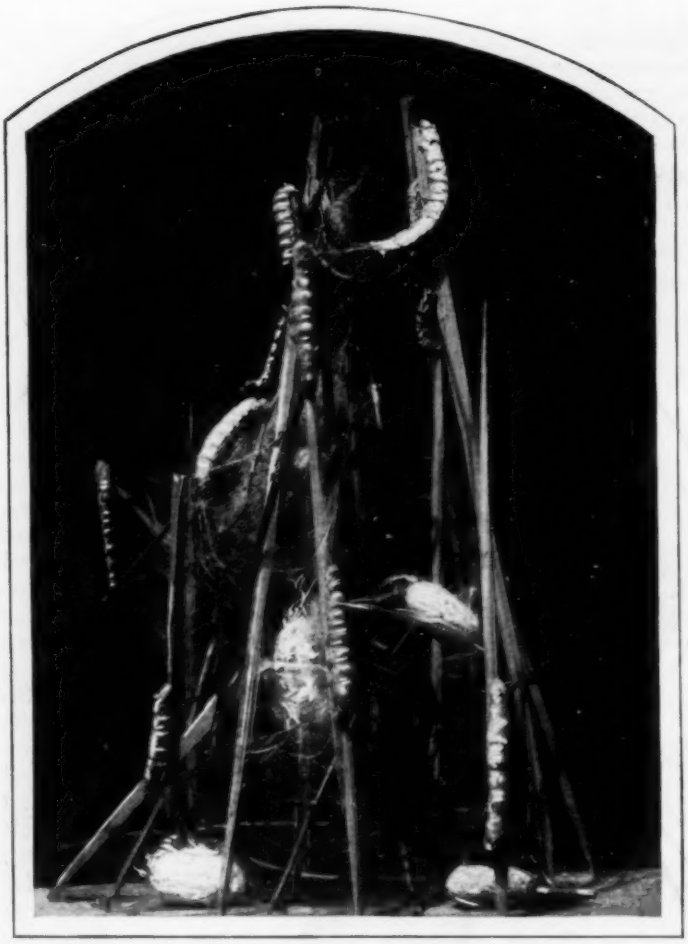
As wound into the cocoon by the spinner, the silk threads are so fine that 1,200 of them must be placed side by side to occupy the space of a single inch. When the fibrous content is taken out, the threads from a number of cocoons are drawn off together and united into a single strand to give the necessary strength. The unreeling process is conducted by hand or by means of mechanical reels. The composite thread is twisted, the gummy substance boiled out, and the material is then ready to be dyed and woven. One cocoon will produce from 800 to 1,200 yards of thread.

The silkworm is a creature of long and honorable pedigree and a record of valuable service covering nearly 5,000 years. The useful career of this creature started more than 2,600 years before the dawn of the Christian era, through the activities of the Chinese Empress, Si-ling, who made the first recorded study of the silkworm and of the handling and weaving of silks. Jealous of their secret, the Chinese rulers decreed death to any person who should reveal the mysterious origin of the fine silks they introduced into world commerce.



Top to Bottom, the Chrysalis, with the Cast-Off Skin; the Moth Just after Leaving the Cocoon; the Spinning of the Cocoon, and the Moth after Finishing Its Life Work

The silkworm is inseparable from the mulberry tree. Under a carefully wrought system of propagation and nurture the eggs of the worm are hatched by artificial heat at the season which brings the mulberry leaves into condition for feeding the new crop of silk producers. The eggs are so tiny as to be invisible to the naked eye, and so light that 45,000 of them tip the scales at something like a single ounce. The hatching takes place on trays covered with perforated paper. An ounce of eggs may produce 30,000 silk-



Courtesy American Nature Association

Silkworms at Work among Twigs of Mulberry Spinning Silk That Will Form the Cocoon from Which Silk Thread Is to Come

worms which will reach the stage of cocoon production. During the thirty days of active feeding, the colony will dine to the extent of almost a ton and a quarter of ripe mulberry leaves. Later they will produce 130 pounds of cocoons, yielding only a dozen pounds of silk.

There is much romance in the story of the world's attempts to penetrate the veil of mystery with which the Chinese cloaked the early centuries of silk production. Tradition sets forth that the eggs of the insect and the seed of the mulberry tree were introduced into India by a Chinese princess who smuggled the contraband in the lining of her headdress. When silk fabrics had reached the Roman empire, the Emperor Justinian resorted to various means of learning the secret of production. His enterprise was aided by two Persian monks who had spent many years in China and had learned the whole art of the rearing of silkworms.

Justinian induced the monks to return to China and smuggle the materials needed for the cultivation of silk, which they effected by concealing a supply of eggs in their hollowed staffs. This stock of silkworms supplied the western world for more than twelve centuries.

FIVE ECLIPSES THIS YEAR

Two eclipses of the moon and three of the sun, as well as the return of several periodic comets, are among the astronomical events slated for 1927. Of the eclipses, only one will attract much attention. It occurs on June 29 and will be visible in England early in the morning, the first eclipse seen there for two centuries. June 15, an eclipse of the moon will be witnessed throughout the United States at 3:13 a. m., eastern standard time; the moon will be completely hidden by the shadow of the earth. The other eclipse of the moon takes place in December but will not be visible in the United States. Concerning the visits of the comets, astronomers cannot be certain when they will happen. Some time in June, the Pons-Winnecke comet, which returns to the neighborhood of the earth every six years, is expected to be much nearer than usual and visible without optical aid. Encke's comet, which has a period of three and one-quarter years, will be visible through telescopes, it is believed, and there are, of course, chances that others may appear.

Samples of Unusual Designs in Venetian Glass; the Material Is So Expertly Made and Handled That It Can Be Worked into Hundreds of Artistic Shapes

Courtesy The Sphere

MAGIC OF GLASS BLOWERS' ART SHOWN IN VENETIAN PIECES

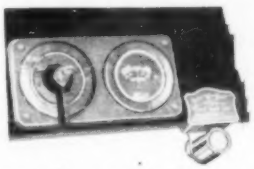
Craftsmen in glass from Venice long have been noted for their skill in blowing delicate and fantastic figures, and one of the secrets of their art lies in the glass itself. It is extremely light and can be drawn into small canes or rods several hundred feet in length. These tubes are colored beforehand so that the blower can work them into various shapes.

BUS LINES SURPASS RAILROADS IN TOTAL MILEAGE

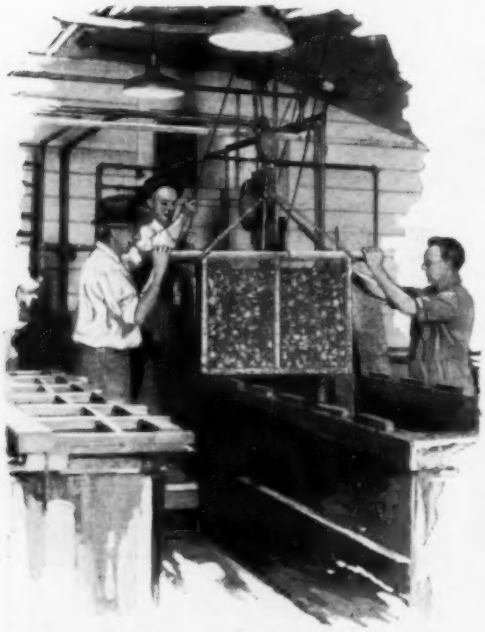
Reports of the interstate commerce commission show that there are more than 22,000 auto busses in operation in the United States, the mileage represented by the routes being nearly 353,000. The great majority of the lines are operated by motor transport companies.

LIGHT TELLS WHEN GAS IS LOW IN AUTO FUEL TANK

Mounted on the dashboard, a red electric lamp lights up when the gasoline supply reaches a low point and remains lighted until the tank is replenished. The signal gives ample warning to prevent running out of fuel entirely. Only a screwdriver and pliers are needed to install it, and it forms an ornamental addition to the instrument board.



BULBS COOKED TO KILL PESTS BEFORE PLANTING



Dipping a Box of Bulbs into the Cooker, to Kill Insect Pests before Planting

To prevent the spread of the "eel-worm," imported bulbs are immersed for two and one-half or three hours in hot water to kill the pests. A specially arranged cooker simplifies the process and insures an even temperature, a highly important factor to prevent damage to the bulbs and yet make sure that the worm will be killed. The outfit handles the bulbs in baskets, or their original shipping containers, and the water is kept between 110 and 111½ degrees Fahrenheit during the treatment. The cooker can be operated by electricity, steam or gas. Small growers in some sections of the northwest have a community cooker that serves a large number of farms.

MEN ARE SEEN THROUGH WALL WITH TELEVISION'S AID

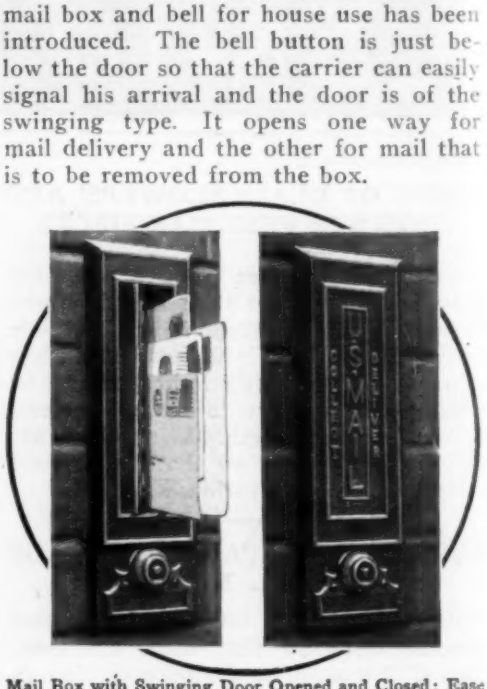
"Looking in" will be as common as listening in to radio programs, according to the prediction of research workers who have been spending much time of late in experimenting and developing this recent marvel. At a demonstration in London, J. L. Baird, a Scottish inventor who introduced television in England more than a year ago, showed what progress had been made when he permitted persons in a darkened room to see others in an unlighted room through walls. At this test, use was made of the infra-red rays which are invisible to the human eye. In the earlier experiments with television, the subject had to sit under powerful lights which proved harmful.

SMOKESTACK USED FOR MOVIES ON OCEAN LINER

A motion-picture outfit and its operator are to be snugly quartered in one of the smokestacks on the steamer "Malolo," the movies being projected upon a screen mounted at the bottom of the after mast. The funnel is a dummy, as is the case with the second stack on a number of modern vessels. The steel cylinder will afford ample fire protection and shield the instrument from the weather.

HOUSE MAIL BOX HAS BELL AND SWINGING DOOR

For the greater convenience of the carrier as well as the owner, a combination mail box and bell for house use has been introduced. The bell button is just below the door so that the carrier can easily signal his arrival and the door is of the swinging type. It opens one way for mail delivery and the other for mail that is to be removed from the box.



Mail Box with Swinging Door Opened and Closed; Ease of Extraction Is Apparent

Better Outdoor Aerials

by S.W. Hull

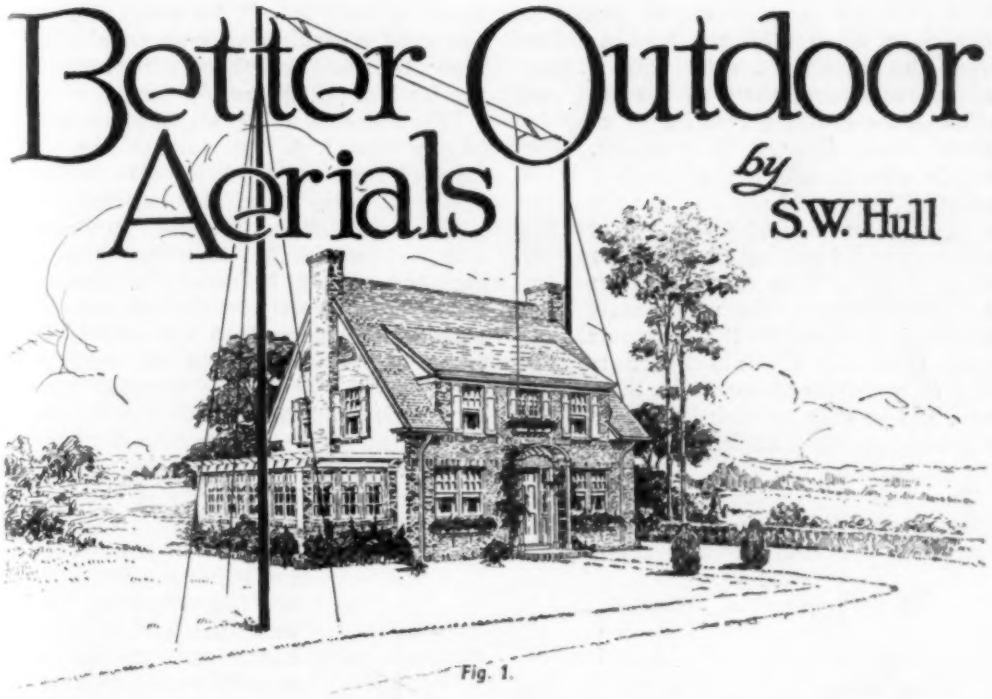


Fig. 1.

ONE of the most important parts of every receiving set is the aerial, or antenna, which picks up, or absorbs, the energy sent out by the broadcasting station. It usually consists of one or more bare copper wires, stretched between insulators, and elevated as high as possible so that it will not come in contact with trees or other obstructions. With warmer weather coming on, outdoor-aerial construction becomes a pleasure, rather than a hardship, and a few hours' work now will earn a reward of long-distance reception during the winter.

While the past years have seen many styles of antennas grow in favor, the outdoor aerial still holds its own. The inverted "L," the "T" and the single-wire straight aerials are the commonest types of outdoor aerials. The inverted "L" aerial gets its name from its shape, shown in Fig. 1. It is widely used and with good results, though it has one defect—its directional property. This, however, is sometimes turned to advantage; it receives the loudest signals when the end to which the lead-in is connected is pointing toward the transmitting station. For example, if you are located at a point on the middle Atlantic seaboard, most of the distant stations would be located west, and it would be advantageous to run the aerial east and west, taking the lead-in from the west end.

Most satisfactory aerials of the inverted-L type employ two wires when the space between the insulators does not allow a single wire of 50 ft. or more. When it is made with two wires, these should be spaced 3 ft. apart, a light piece of wood being used for a spacer. Such an aerial should be at least 35 ft. above the ground and it is better if it is 50 or 60 ft. high. The lead-in should, of course, be taken from the end nearest the receiving set, and, in all cases, the connections should be carefully soldered. If space is available for a one-wire type, it is a good idea to make the horizontal part and the lead-in one continuous wire. A turn or two around the near insulator will anchor the wire, and no soldered joint is necessary.

The T-aerial, as the name implies, is T-shaped, as shown in Fig. 2. It is free from the directional properties of the L-type, and receives from any direction equally well. A single-wire T-type aerial should be at least 100 ft. long, but if conditions prevent putting up this type, a multi-wire construction must be used.

Four or more wires should be placed at least 2 ft. apart, and the lead-in taken from the middle of each wire. These lead wires should then be bunched and soldered to a single lead-in, or may be taken down fanwise if practical. The lead-in wire to which the bunched leads are soldered should always have the same area, or cross section, of wire as the antenna, to avoid cutting down the capacity of the aerial. This also holds true for the one-wire type, where a separate lead-in wire is soldered to the horizontal section. Generally the multi-wire type is used on apartment houses or other buildings, and in such cases it is best to place it above any other aerial that may be on the same roof.

The straight-line aerial, shown in Fig. 3, has a very short lead-in, coming almost direct to the set. Generally, one end, preferably the set end, is lowest, the far end being elevated above roof and tree-top interference. This arrangement is favored by many because of its simplicity and efficiency. As in any antenna of the one-wire type, the aerial and lead-in should be in one piece, if possible, in order to cut down any resistance that a poorly soldered joint might cause. It will be noted that but one mast is required with an aerial of this type; the total length of wire, including the lead-in, should be 100 feet.

When constructing an outdoor aerial of any type, it is necessary to use some form of approved lightning arrester; this device is screwed to the building at a point convenient to the inlet to the set, and is shown in the inset illustration on page 651. It will be noted that the lead-in is taken directly to the set, an extra wire being soldered to the lead-in and taken to the terminal marked aerial on the arrester. The other terminal of the arrester is grounded outside the building. In the same illustration the lead-in is shown coming down over the edge of the roof, and is carried out over an insulator; this should be done in all cases where the lead-in is likely to come in contact with the building. Heavy sleet or high winds will often bring the lead-in in such contact, and the set owner will wonder why the signals come and go, or go altogether. This is easily prevented by careful insulating, and the installation will last almost indefinitely.

When we realize the minute strength of the signals as picked up by the aerial, the importance of good insulation becomes apparent. A

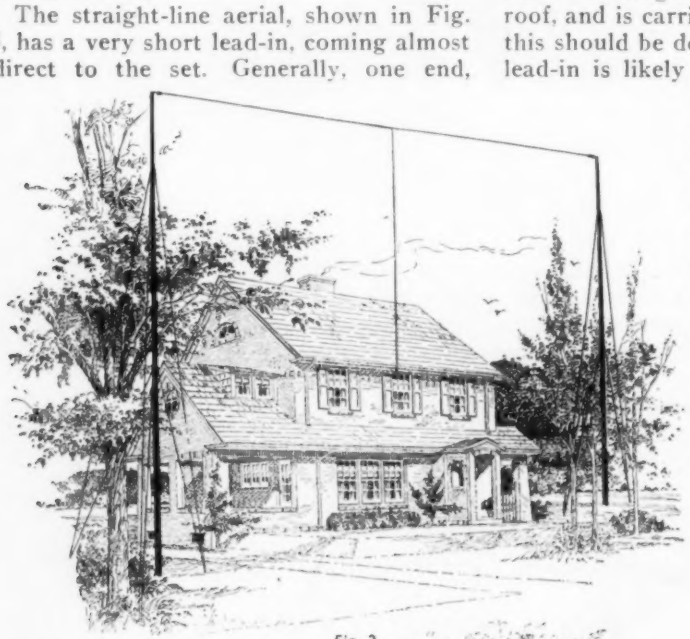
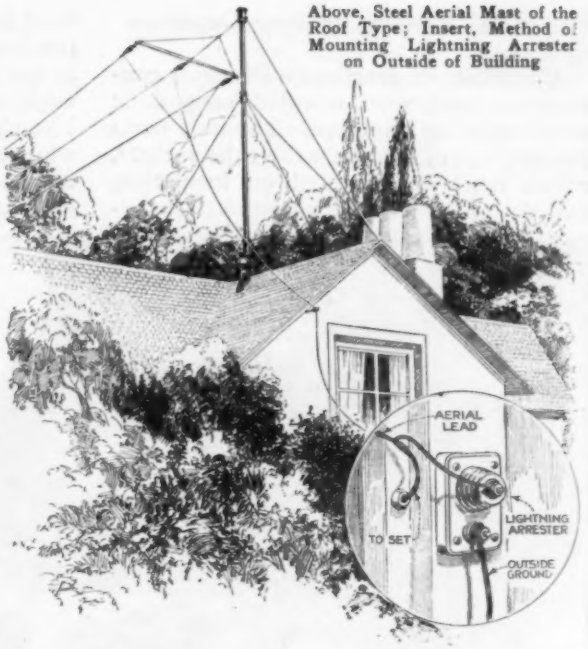


Fig. 2.

Fig. 3

good aerial installation is just as essential as a good set, and before beginning its construction the following details should be kept in mind: Over-all length not over 125 ft.; no close approach to trees or buildings, and the horizontal part as high as possible; furthermore keep the lead-in away from building; make no joints if they can be avoided; use as few insulators as possible; wire should be No. 14 and kept as taut as possible, and clean connections throughout. Height is, of course, also an important factor. There are a number of excellent steel masts now on the market, in both the earth and roof types, which are available in lengths of 20, 40 and 60 ft. The roof type is furnished with an adapter so that it may be mounted on either a flat or a peak roof.



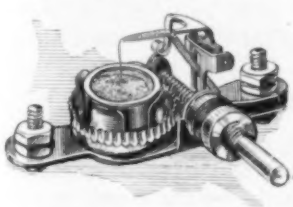
Above, Steel Aerial Mast of the Roof Type; Insert, Method of Mounting Lightning Arrester on Outside of Building

The erection of the mast should receive careful attention. The steel masts referred to are light, strong and easily set up. All guy wires should be galvanized and securely fastened to insure proper wind resistance. It is advisable to use a masthead pulley so that the aerial can be raised or lowered at will with the least possible effort.

The set ground is also a part of your aerial system and should be given careful consideration. The ground lead should be as short as possible, and connected to a water pipe with a good stout ground clamp. The point of contact should be filed bright, as a poor ground connection renders the entire system inefficient. A good aerial is well worth the trouble it takes to make, for where the average set brings in distant stations occasionally, the man with a first-class aerial will get them consistently, and high-priced radio sets often may prove disappointing or even a total loss, as far as distance reception is concerned, if the aerial is not erected in the proper manner.

Adjustable Crystal Mounted on Panel

An adjustable crystal of the multi-point type, designed for panel mounting, is shown in the illustration. It is fastened through a single hole in the same manner as a condenser or rheostat, and the ¼-in. shaft is provided with a knob at the outer end. This rotates the crystal cup by means of a worm gear and the contact point of the cat whisker is raised and lowered automatically for each new position by means of a small cam. About 250 sensitive spots on the crystal can be reached before readjusting is necessary.

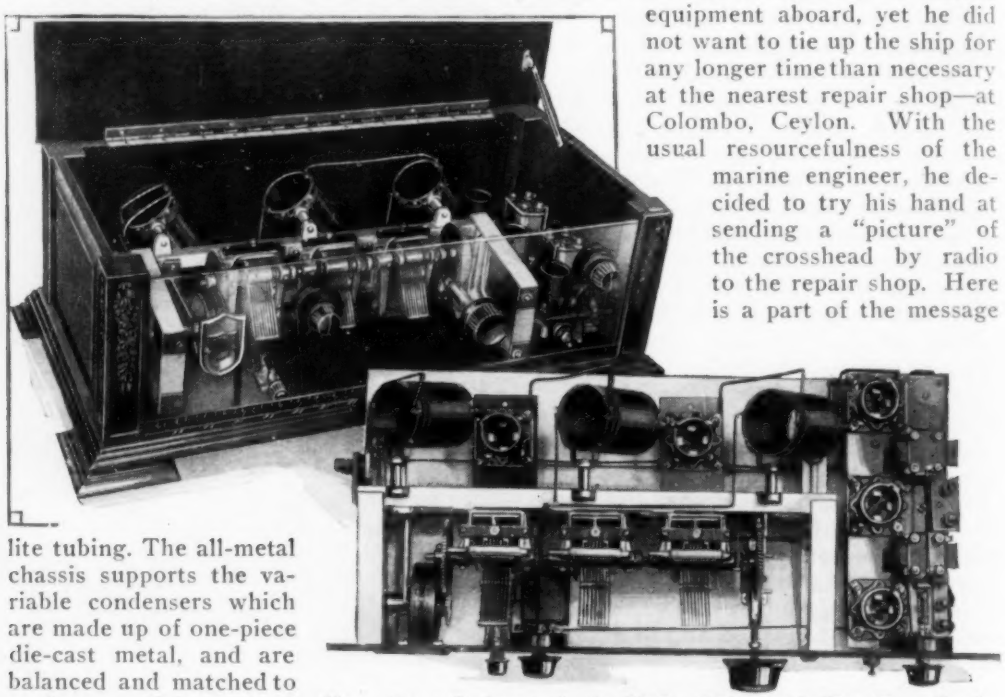


Setting Rheostats with Milliammeter

If a milliammeter is used in the set, the exact amount of B-battery or plate current consumed is visually checked at all times. When the rheostats are turned too high, an excessive plate current is used while there is little or no increase in volume. The rheostats can be regulated so as to use the minimum amount of B-battery current consistent with good volume. Without a milliammeter there is no way of determining this consumption.

All-Metal Receiver Is New Departure

A receiver of practically all-metal construction and with one-dial control, is now attracting attention. The only parts that are not of metal are the tube sockets, which must be mounted on insulation, and the coils, which are wound on bakelite tubing. The all-metal chassis supports the variable condensers which are made up of one-piece die-cast metal, and are balanced and matched to make one-dial control practical. Accuracy of tuning is achieved by an ingenious floating worm-gear drive, in which wear is automatically taken up by spring tension. The coils are mounted in a copper shield, thus eliminating pick-up from strong local stations and making selective tuning possible. The tubes are mounted on cushioned sockets, and the audio transformers, assembled with the sockets on a metal base screwed to the chassis, complete the set. The glass front panel shown is used only for display purposes.



Above, Set as It Appears in the Display Cabinet with Glass Front Panel; Below, Complete Unit Assembly Removed from the Cabinet

A Picture by Radio

An Australian ship was proceeding down the Gulf of Aden, a place where the temperature in the engine room reaches 154°, when the air-pump crosshead stripped off its rods. What an air-pump crosshead is need not interest us greatly, but the breakdown stopped the ship. Within ten hours temporary repairs had been made, and the ship was under way again. The chief engineer, one Mr. A. U. Cross, while satisfied that the repair would hold up, naturally desired a more substantial job than could be done with his limited equipment aboard, yet he did not want to tie up the ship for any longer time than necessary at the nearest repair shop—at Colombo, Ceylon. With the usual resourcefulness of the marine engineer, he decided to try his hand at sending a "picture" of the crosshead by radio to the repair shop. Here is a part of the message he sent: "Due noon Monday; require steel crosshead for air pump, forged solid, consisting of center rectangular block having on each side tapered piece terminating in journal pin for link brasses, end of pin having collar. Front elevation over-all length sixteen one-eighth, rectangular center three seven-eighths long, seven deep." There was more of it, but this is enough. On the ship's arrival the job was done.

Radio Soldering Hints

A small electric or plain-heat iron, some wire solder, and a small tin of common soldering paste, make up the simple equipment required to do a good job. Have the iron hot enough to flow the solder on the joint; never brush it on. Use a small bit of flux paste on the end of a toothpick,

apply it to the joint to be soldered, and then wipe it off, the idea being to leave only a slight film of flux on the joint. The iron must be clean; a dirty iron, or one not hot enough, will not make a good joint, as the heat cannot reach the joint if the end of the iron is corroded File the soldering copper clean, and tin it well so the solder will stick. Never apply the hot iron to fixed condensers, and use soldering lugs on all instruments likely to be injured by heat. When building a radio set employing exposed coil windings, do not mount these coils on the subpanel until all the soldered joints possible have been completed, as one will often accidentally touch the coils with the iron or drop solder on the windings, causing short circuits. When the coils are mounted and soldering is to be done around them, protect the windings from the iron with a metal shield, and cover the coil with a small cloth to prevent solder from dropping between the turns and damaging the insulation. These precautions refer to all sets, but particularly those employing unprotected solenoid windings, and coils of the toroid or doughnut type.

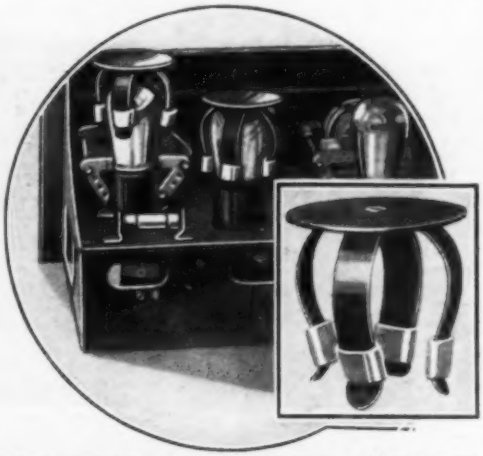
New Insulating Material Easy to Work

A new insulating material that is easy to work and is claimed to have exceptional insulating properties is now available.

This product is said to combine the strength of steel with the high insulating qualities of rubber and porcelain and the adaptability of wood, and can be sawed, drilled, tapped and punched with ease, clean holes being drilled with a hand drill, as shown in the illustration. It is suitable for panels, jack spacers, transformers and general insulating, and consists of laminated bakelite, made by carefully impregnating fibrous materials.

Preventing Tube Vibration

When great volume is developed in the loud speaker, and the latter is on or near the set, a heavy vibration will sometimes be set up in the tubes. The result is a loud hum from the speaker, which often rapidly increases until it becomes a roar, drowning out the program. The detector tube is the most frequent offender, although any tube in the set may develop the trouble. When the vibrating tube is held by the fingers, the noise will stop. The spring-clip device shown in the photos has been developed to cure this trouble, and usually proves effective.

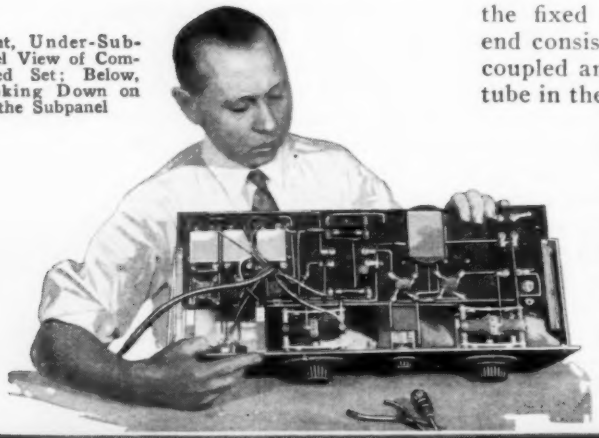


Placed over the Tubes in the Set, the Rubber Fingers Grip the Tube, Preventing Vibration

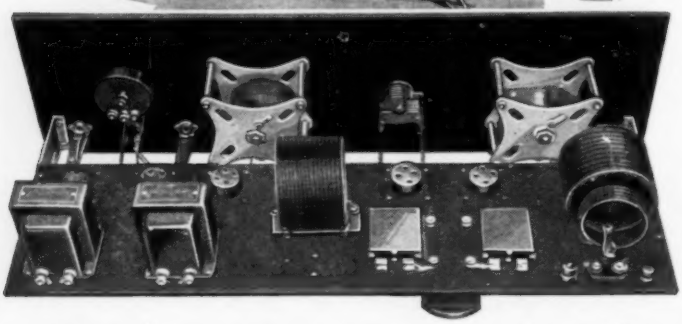
Doping Coils Increases Resistance

Coils, doped or bound with any of the various preparations used for the purpose of mechanically strengthening them have a higher resistance. This causes a loss of efficiency, and tends to lessen selectivity; if a binder must be used, collodion is best. Coils of the solenoid type are considered to have the highest efficiency. These single-layer coils do not require a binder. A skeleton form can be used with good results; a form of this kind can be made out of bakelite tubing by cutting it away as much as possible without weakening it so it cannot support the winding.

¶Leads hanging over A-battery vents are soon destroyed by fumes when battery is being charged.



Right, Under-Subpanel View of Completed Set; Below, Looking Down on the Subpanel



Five-Tube Receiver in Kit Form

A five-tube receiver in kit form, ready to assemble and wire, has lately made its appearance on the market. The circuit, although not radically new, embodies some interesting ideas. The outfit consists of two stages of r. f. amplification, a detector and two stages of audio frequency. Only two tuned circuits are used, the first being the input to the first r. f. tube. The coupling between the first and second tubes is obtained through a fixed r. f. transformer especially designed for the set. The neutralizing or balancing condenser is mounted on the front panel. This permits a slight variation from the neutralizing point and introduces regeneration in the first tube. The signal is built up to a large degree and transferred to the fixed r. f. transformer. The audio end consists of two steps of transformer-coupled amplification, employing a power tube in the last stage.

A Power Device, Showing Lid Removed from Metal Container

Conduit Makes Good Aerial

In apartment houses where rules against bringing the radio lead-in through a front window make it impossible to erect an outside aerial and keep the lead wire within a reasonable length, the metal conduit system will be found to offer a good substitute. Place the radio set near one of the base outlets, which furnishes a handy place for plugging in the battery charger. Loosen one of the screws which hold the brass plate of the outlet and twist the end of the aerial lead around it, then tighten the screw. The entire metal-conduit system of the building then becomes the aerial. Tried out against the usual inside aerial placed around the picture molding, the electric conduit proved superior, getting greater distance and better volume.

New Unit Replaces Storage A-Battery

Replacing the A-battery with a compact unit connected with the house-lighting circuit, the device shown in the illustration is a welcome addition to modern radio equipment. A steady, unfailing A-current of 6 volts, regardless of how long or how often the set is used, is claimed for this new device. It is stated that there is no hum or distortion, and the instrument operates only while the set is in use. It is designed for receivers employing from four to eight tubes of the standard ¼-amp. type. Terminals marked A-negative and A-positive are provided.

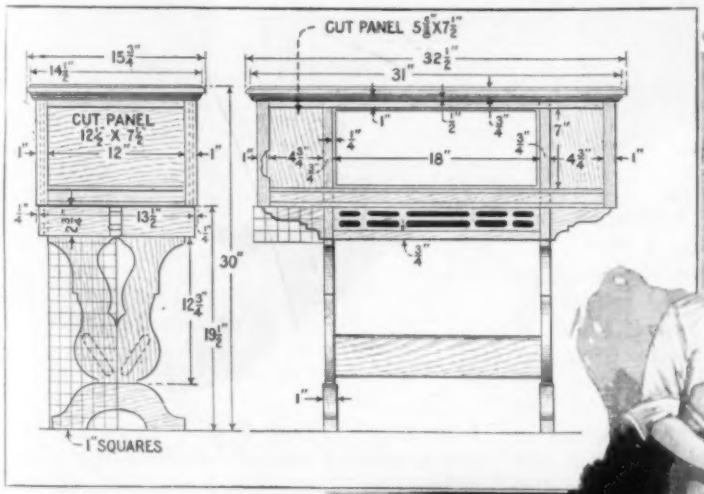
An Unusual Homemade Radio Cabinet

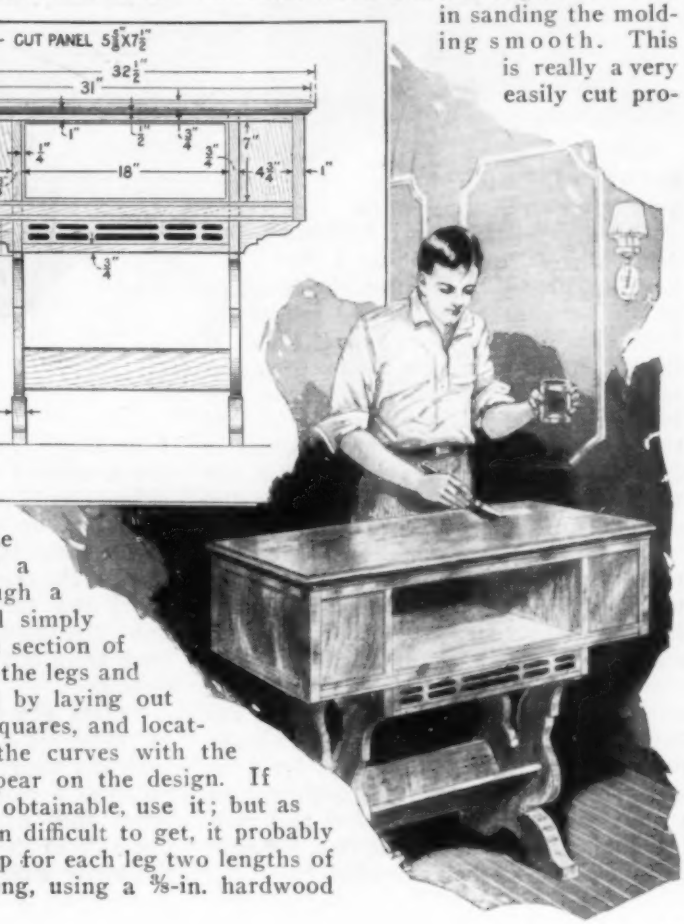
By EDWIN M. LOVE

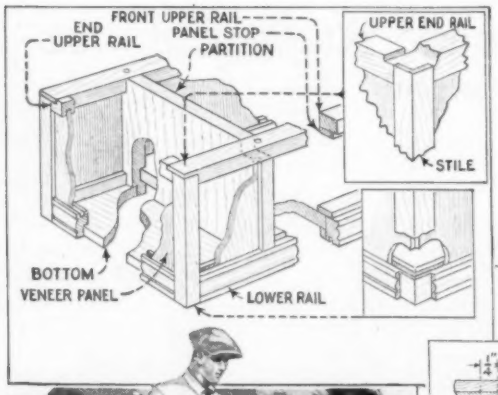
TOO often the amateur radio-cabinet maker confines his work to plain, box-like pieces with square posts for legs. The introduction of curves into a design generally much improves the appearance of the article, and need not materially increase the difficulty of construction. In the design presented here, console lines are followed, but several unusual features are added. Space for a cone-type loud speaker is provided underneath, the diaphragm lying flat, so that only a narrow grill betrays its presence. The case itself is readily detachable from the stand, by the removal of six screws, and a book trough takes the place of the more common stretcher.

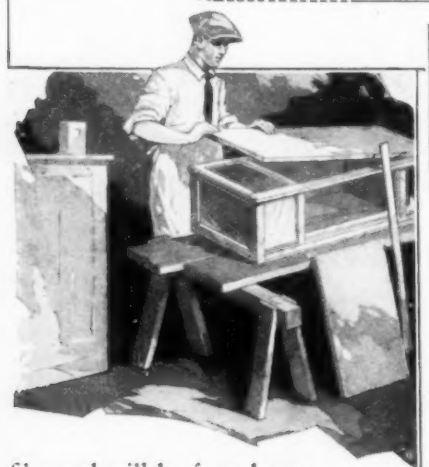
The cut on this page shows the front and end elevations of the cabinet, dimensioned for a 7 by 18-in. panel, although a longer panel can be used simply by lengthening the middle section of the case. The outlines for the legs and brackets are easily copied by laying out a piece of paper in 1-in. squares, and locating the intersections of the curves with the squared lines, as they appear on the design. If 14-in. stock for the legs is obtainable, use it; but as such wide material is often difficult to get, it probably will be necessary to glue up for each leg two lengths of 1 by 8-in. stock, 18 in. long, using a ⅜-in. hardwood dowel 2 in. from the upper end, and one 5 in. from the lower end. Let the glue harden while other parts are made.

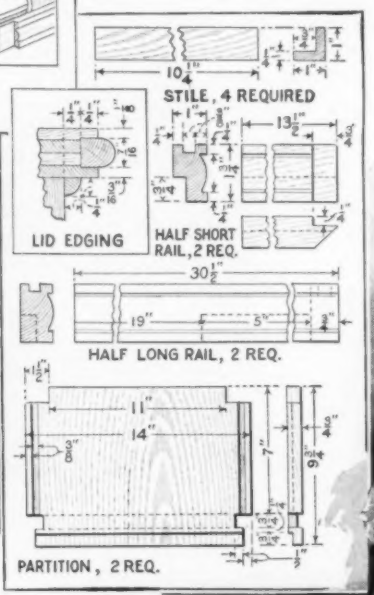
General construction details of the case are shown on page 656. Glue, edge to edge, two pieces of 1 by 8 by 20-in. material for the partitions, and, for the bottom, two pieces, 2 ft. 9 in. long. The molded lower or long rail is of 1⅛ by 2-in. stock, sized to 1 by 1¾-in. Square up two pieces, long enough to make all molded rails, and ¼ in. from each edge, on the face sides, plow ⅛-in. grooves, 3/16 in. deep. Then, with plane and chisel, round off the center part to the profile shown in the cross section. Make a rubbing block, 1 in. thick, with an arc of 15/16-in. radius worked in the edge, and use it in sanding the molding smooth. This is really a very easily cut pro-

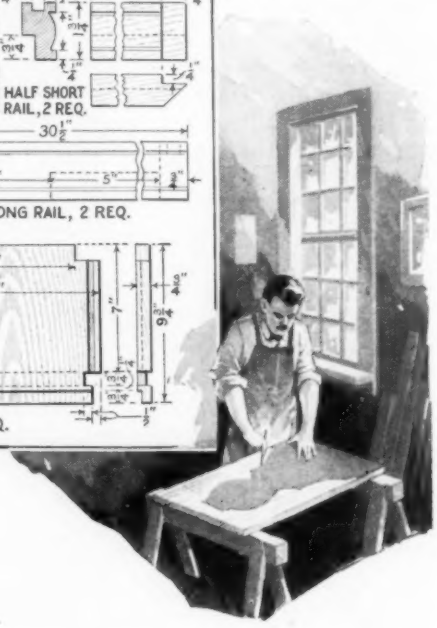












file, and will be found surprisingly rich in appearance.

For the end rails, cut a 13½-in. length, from each. Plow a ⅜ by ¼-in. groove ⅜ in. from the front, on the upper edge of each, and rabbet the back face on the lower edge, ⅜ by ¾ in., as shown, to receive the bottom. Lay off the ends for the mitered tenons, giving the molding a length of 12 in. and the tenons ¾ in. These are notched in from the molded faces ¼ in. Rip the tenons to thickness before sawing the shoulders. Miter the ends last.

The long rails are somewhat more complicated. Make tenons on each, as for the short rails, giving a length of 2 ft. 5 in. from shoulder to shoulder. For a distance of 5 in. from each shoulder groove the upper edges as in the short rails, to receive the front panels of the battery boxes. Likewise rabbet the backs on the lower edges. This can be done quite easily by accurate gauging, and cutting cross chips with chisel and mallet. Finish the blind ends square, for such bracing effect as they can offer.

The four corner stiles are finished 1 by 1 in., 10¼ in. long. Gauge lines ¼ in. from each face side, and rip out the back corner strips, ¾ by ¾ in., as indicated. Smooth the strips with a rabbet plane, and notch the inner faces, ⅛ in. deep, so that they will fit over the tenons of the upper and lower rails.

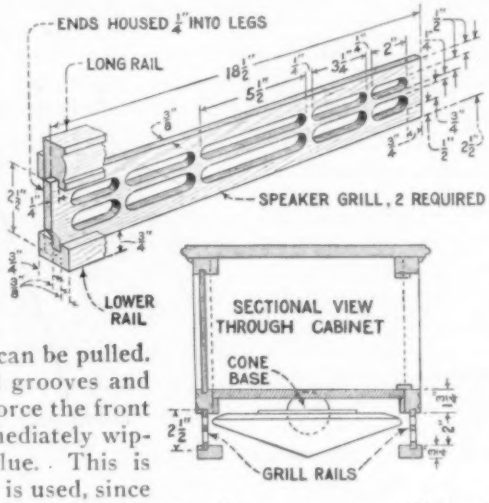
The long upper rails are sized exactly to 1 by 1½ in. by 2 ft. 7 in., and the ends notched full width, ¾ in. deep and 1 in. long. These fit over the stiles and the short-rail tenons. Groove the lower sides ⅜ by ¼ in., ⅜ in. from the faces, and notch the upper edges of the short rails at the ends, ¼ in. deep and 1½ in. long, to take the tenons of the long rails. Also notch the face sides, ¼ by ¾ in. Cut away the inner sides of the grooves ½ in. back from the ends, to fit over the front panels.

Square the partitions as shown, making them 1 ft. 2 in. wide and 9¾ in. long, with the upper corners notched 1 by 1½ in. to fit around the upper rails, and the lower ends notched ½ by 2¼ in. Dado one side of each, ¾ by ¼ in., 1 in. from the lower end, and rabbet the lower end

on the opposite side, ¾ by ¼ in. Notch the dados, ½ in. below the long notches as shown, and groove the rabbet faces, ⅜ by ¼ in., ⅜ in. from the edges.

Make two front and two back panels of ⅜-in. three-ply panel veneer, 5⅝ by 7½ in.; two end panels, 12½ by 7½ in., and a back panel, 7 by 18 in. Make two short bottoms, ¾ by 12¾ by 5⅜ in.; size the inner ends by giving them one coat of liquid glue. Make the long center bottom 1 ft. 6½ in. long and 12 in. wide. Size both ends. Size the end grain of the dados and rabbets in the partitions, and the notches, shoulders, and tenons of the rails.

To assemble the case, proceed as follows: Glue the long bottom into the partition, securing it by driving nails through the partitions, leaving the heads projecting so that they can be drawn. Glue the long rails to the partitions and the long bottom, nailing through the top rail into the partition, and from the rabbet into it, but leaving the heads out so they can be pulled. Apply glue to the rail grooves and the panel edges, and force the front panels into place, immediately wiping off all surplus glue. This is feasible only if veneer is used, since it will not shrink or swell. Glue and nail the end panels between the front ones, again with the nail heads projecting. Glue the upper end rail in place, and then the lower. See that all joints are snug, and that the whole assembly is square, and set aside to dry.

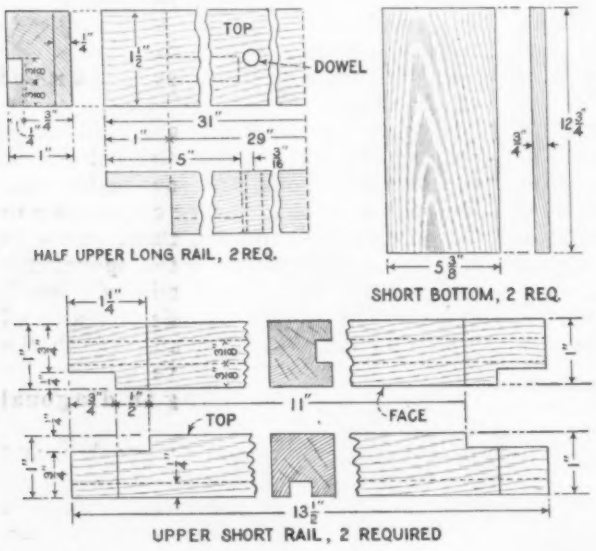


The lid preferably should be five-ply veneer, ¾ in. thick, but solid stock can be used, if stout cleats are screwed to the underside, where they will enter the instrument section, out of the way of the batteries. The finished size is ¾ in. by 1 ft. 3 in. by 2 ft. 8 in. Plow a 7/16 by ¼-in. groove all around the edge, ⅛ in. from the top face, and glue into it a 7/16 by 9/16-in. strip. Make this just thin enough to slide in and out without the need of prying. Slip a piece in a long edge, being sure that it touches the bottom, and mark the positions of the lid corners. Miter the ends through these points, and replace. Wedge tightly enough to prevent its shifting, and fit the endpieces. With one in place, fit the other edge strip, and then test all in place. When good joints have been obtained, glue the strips in, and round off the edges.

Two or three methods are available in shaping the legs. Trace the pattern on the prepared stock, and saw to the outline with a turning saw, or cut roughly to shape with the handsaw, chisel nearly to the line, and finish with the spokeshave and rasp. Any planing mill will bandsaw them and shape the edge for a small price. If it is cut by hand, smooth the concave curves by filing in diagonal strokes, twisting during the strokes, and lifting on the back movement. Finish with sandpaper. On the lower end, cut a tenon 2½ in. wide, ⅜ in. thick, centering on the thickness of the stock, and 2 in. long. Rip the cheeks and the edges before cutting the shoulders. Locate the mortises for the trough sides, as shown, remembering that they make an angle of 90° with each other, and 45° with the center line. If there is any variation, the two legs will be held in a twist. The mortises are 4 in. long. Since the ends are semicircular, a ¾-in. bit can be used for cutting them, but take care that the point does not prick through. Chisel out roughly, and trim to the line, bringing an accurate depth of ¼ in. Plow ⅜ by ¼-in. grooves, ⅜ in. from the edges at the upper ends, to receive the ends of the speaker grills. Mortise ¼ in. deep by ¾ by 1⅛ in. for the ends of the lower grill rails. Make two brackets of 1 by 4-in. stock, allowing ¼ in. on the ends to house into the legs. The two trough boards are ¾ by 4 in. by 1 ft. 6½ in., with edges rounded. Size the ends.

Make two grill rails of the same length,

¾ in. thick by 1½ in. wide, plowed ⅜ by ¼ in., ⅜ in. from the outer edges. Notch the ends ⅜ by ¼ in., to fit the leg mortises, and size the ends. Make two upper rails like the lower, but 1 ft. 6 in. long, and without the notches, as they go between the lower ends of the case partitions.



Make two grills of panel veneer, 2½ in. wide and 1 ft. 6½ in. long. Gauge lines, full length, ½ in. from the edges. Divide for the lengths of the openings as follows: ¾ in. from each end; 2 in. farther; ¼ in.; 3¼ in.; ¼ in. Bore ½-in. holes in each space and cut out with a fine keyhole or a bracket saw. Trim the ends smooth, with corners rounded to a radius of ¼ in., and sandpaper them.

Assemble the legs with the trough boards and the lower grill rails, and glue in the grills. Screw cleats inside the grill ends, and also inside the upper ends, giving them ¾-in. projection above.

Make two feet to the design shown, of 1⅛ by 5-in. stock. Cut the mortise before shaping the curves. Then glue in the leg tenons.

Now draw out all nails from the case, and glue the corner stiles in place. Glue in the end bottoms, and miter around the top rail a ¼-in. quarter-round, secured with brads which are drawn when the glue is dry. Bore ¼-in. holes through each long upper rail into the partitions, for the gluing in of dowel pins.

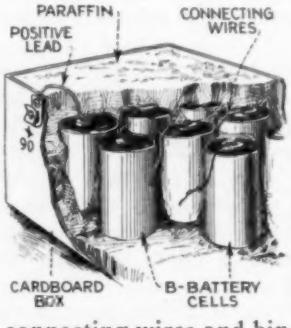
Clean up the cabinet thoroughly and hinge the lid to the back with 2 by 2-in. brass butts, mortised in. Glue strips, ¼ by 1½ in., around the radio-panel opening, ⅜ in. plus the panel thickness from the front, to act as stops for the panel, which is built drawer-style, to pull out from the front. Similar stops are put in the back, ¾ in. from the face, for the gluing in of the veneer panel. Finally, glue ¼-in. cleats to the lower rails underneath the bottom.

Secure the speaker to the underside, and hold the case in position by means of two screws through each leg cleat into the partition ends, and one through the tip of each bracket. Scrape and sand out every scratch and all visible glue before finishing.

The original speaker used with this cabinet fitted into a 4 by 12 by 12-in. space. Since there is no bottom to the speaker compartment, any size of speaker can be accommodated here and any projection below the grill would usually be unnoticeable. Of course, the width of the grill could be altered to suit a large speaker of unusual "thickness."

Salvaging Old B-Battery

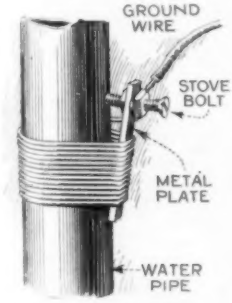
Many B-Batteries, when discarded because of a great drop in voltage, still have a few good cells left. These cannot deliver their power because of the high resistance in the dead cells, but they should not be sacrificed. If the batteries have a cardboard container, tap around the top edge with a hammer, carefully chipping away the sealing compound from the cells and taking care not to break the carbon elements in the cells. Remove the connecting wires and binding posts with a soldering iron. Now test each cell with a



small flashlamp; cells that produce only a red glow in the lamp, going out in a few minutes, cannot be reclaimed. Cells that light up the lamp brilliantly may be used in making up a new unit. For this, a container such as a candy box will do nicely. Place the cells in the box in the manner shown in the illustration, connecting them in series. The carbon or top terminal is the positive, and the zinc shell the negative. Solder small flexible leads to these points. The box should be about ¾ in. deeper than the cells are high; space the cells about ¼ in. apart, and pour in melted paraffin very slowly. It is best to pour in about half an inch at a time, permitting each layer to cool before adding more. The binding posts are tapped off to leads long enough to permit mounting them on the side of the container.

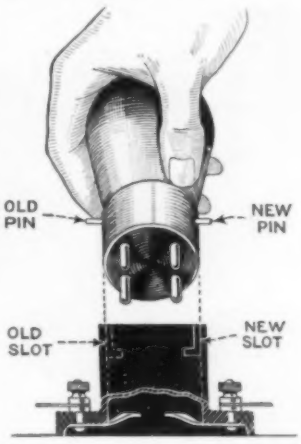
A Good Ground Connection

The importance of a good ground connection for the radio set cannot be stressed too much. It is well known that the ordinary cold-water pipe offers a good ground, and it is generally available. To solder a wire to the pipe is difficult, and while there are a number of good ground clamps on the market, usually, when needed most, they are not at hand. The illustration shows a simple and effective way to secure a good contact. The pipe is first scraped or filed around the portion from which the lead is to be taken; heavy copper wire of about No. 12 size is wound around the pipe and a metal plate, as shown in the sketch. Drill a hole in the plate near the end, and insert a common stove bolt on which are screwed two nuts, one on either side of the plate. By screwing down the bolt, the plate acts as a lever, and the wires are drawn tight on the pipe. One end of the wire is fastened by the upper nut; the other is wound under the first turns, and the No. 12 wire is continued to the ground post of the set.—Harold Zahl, Naperville, Ill.



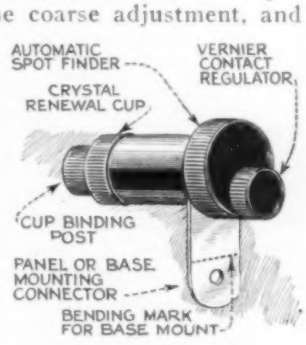
Added Pin Improves Tube Contact

Trouble is often encountered by poor contact between the tube prongs and socket springs. This may be traced to the fact that there is only one pin on one side of the tube base, which engages with the socket shell. The tube is held down well on the pin side, but the contacts on the opposite side do not make proper connection. This condition is remedied by drilling a hole in the bakelite tube base, tapping it with a 4-32 tap, then driving in a brass machine screw of this size and chipping it off so that about 3/16 in. projects. In the socket, at the point where the new pin should connect, a slot is made exactly like that on the opposite side. This makes a double-bayonet base, which is sure to pull both sides of the tube down evenly.—Harold P. Strand, Malden, Mass.



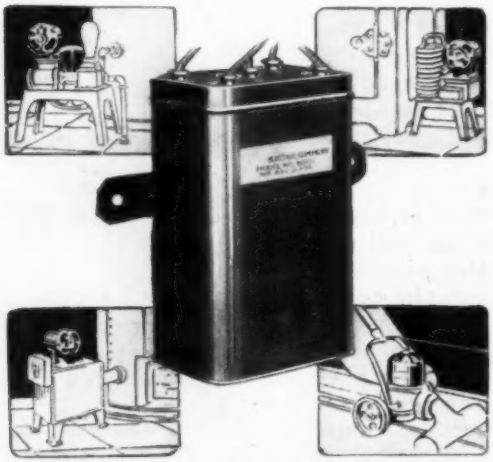
Detector Crystal Has Vernier Adjustment

A vernier detector crystal, fitted for either panel or subpanel mounting, is now available. The special features are pointed out in the illustration; the automatic spot finder is for the coarse adjustment, and the vernier knob at the front provides a fine contact regulator for obtaining maximum results. The crystal renewal cup at the rear is detachable. The neat design and simple method of mounting make this unit a desirable addition to any crystal radio receiver.



Light-Plant Interference Eliminator

A device for eliminating interference from light plants, and motors of all types, is now available. In plants of the farm-



Interference Eliminator Ready for Installation and Various Electrical Trouble Makers

lighting type, the instrument is of special value as interference from this source is very common. Interference from various household electrical apparatus is of frequent occurrence in cities. This device can be used on all such appliances without disturbing the efficiency of the apparatus. It furnishes an easy path for the escape of the interfering vibrations to the ground and builds up a barrier that prevents them from going to the electrical wiring and causing disturbing reradiation, not only in the house but in the whole neighborhood.

Why a Power Tube Is Used

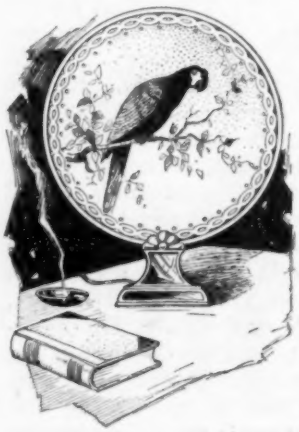
There is, perhaps, no more misleading name among radio terms than "power" tube. The mere addition of a tube of this type to a receiving set will not increase the volume tremendously, as is usually expected, for it is not a source of power. It can, however, handle far greater power than the usual tube, and in this lies its advantage for quality rendition of radio programs. The standard A-type tubes have limited capacity. They can handle the minute currents found in r. f., detector and first audio-stage operations, but for the last amplifying stage they cannot pass the full power of a multi-tube set without distortion. Therefore the loud speaker is not operated at anywhere near its full capacity. As volume adds the final touch of realism, and as bass notes require far more power than the higher notes, a tube capable of handling this increase without overloading, choking and blurring reception is essential.

Simple Test for Open Secondary

A simple test for an open secondary, where the terminals can be reached with the fingers, often locates the trouble quickly. Wet two fingers slightly and place them across the secondary of the a. f. transformer while the set is in operation; if the volume immediately increases and there is less distortion, the secondary is open at some point. The best remedy, of course, is a new transformer. The explanation of this simple test lies in the grid return provided by the fingers; the tube was choked up because there was no grid return, due to the open winding, and the fingers allowed the charge to leak off, thus increasing the volume.

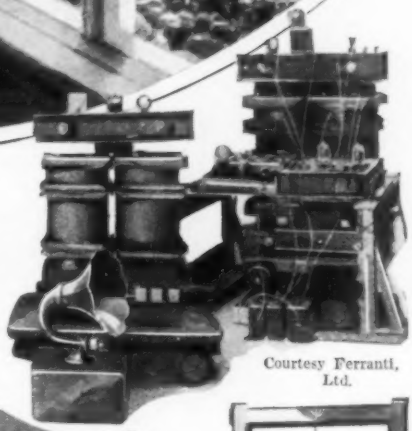
Decorating the Cone Speaker

The cone speaker is an excellent instrument, but there is something blank about its appearance that makes it unsightly. It may be greatly improved, in fact, it can be made very decorative by ornamenting it with some design such as shown in the illustration. This is simply made by cutting out a parrot from crepe paper and mounting it on the front of the speaker by means of glue or shellac. A large number of suitable designs may be found on the modern crepe papers used for decorative purposes.



Radio Happenings Far and Near

Above, Carl Menzer Broadcasting Grid Game between Universities of Iowa and Minnesota from Inclosure above Grandstand

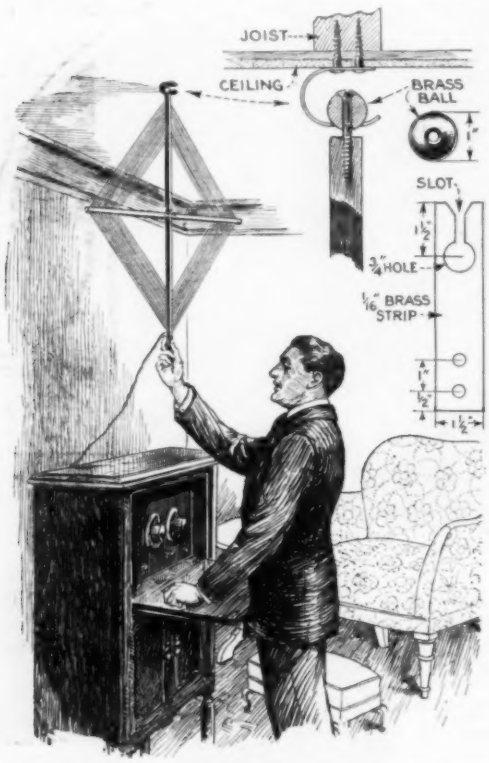


Courtesy Ferranti, Ltd.

Upper Left, Dr. Austin of Bureau of Standards Making Observations with Giant Double-Axis Loop; Right, Huge A. F. Transformers Used in Test by English Manufacturer to Prove Need for Large Iron Cores; Below, Apparatus Used by WGY to Create the Sounds of a Train

Suspended Loop Saves Space

Even a comparatively small loop aerial occupies more table space than the radio



Loop Suspended from Ceiling, and Details Showing Bearing and Mounting Strip

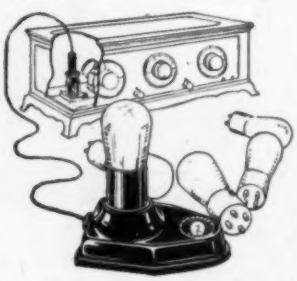
fan is prepared to allow it. A 4-ft. loop for long-distance work is too large for the average living room, if used on the table. One practical solution of the difficulty is to suspend the loop by means of a universal bearing from the ceiling. The bearing shown in the drawing is simple, and permits easy insertion and removal of the loop. When not in use, the loop may be lifted off the ceiling bearing and hung flat against the wall where it will take up very little room. The bearing consists of a 1-in. brass ball screwed to the end of the loop shaft, no further alterations in the loop itself being necessary. A slotted brass strip, fixed to a ceiling joist, supports the ball, the slotted end being just wide enough to admit the screw shank. The ball rests in a ¾-in. hole at the end of the slot. This ball bearing will cause the loop to hang vertically, and allow it to be turned readily in any direction.—C. A. Oldroyd, Barrow-in-Furness, England.

Placing Coils in the Set

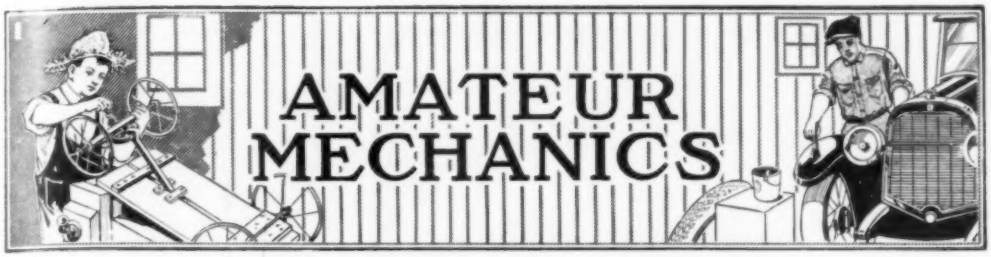
Interaction between coils in a receiver can be minimized or eliminated if some attention is given to the locating of the coils in assembling the set. Coils of the single-layer or solenoid type are the worst offenders, but if placed in the set correctly in relation to the other coils, they will give very little trouble in this respect. Energy will not be transferred by induction into another coil, if the plane of the wires constituting the winding is at right angles to the wires of the other coil.

Simple Tube Tester Employs Lamp

A simple and efficient tube tester, employing a small glow lamp, has recently made its appearance on the market. The radio owner without technical knowledge of tube characteristics can use this device to determine the efficiency of the various tubes in the set. The tester shows instantly whether a tube is in condition for satisfactory use and in what capacity the several tubes of a set will operate most efficiently. It does not measure the various elements of the tube separately, but their effective combination under working conditions. To use the instrument, the plug is inserted in the socket of the set and the tube is placed in the tester socket. The rheostat, controlling the filament current to the socket in which the plug is placed, is then turned up till the small lamp in the tester glows.



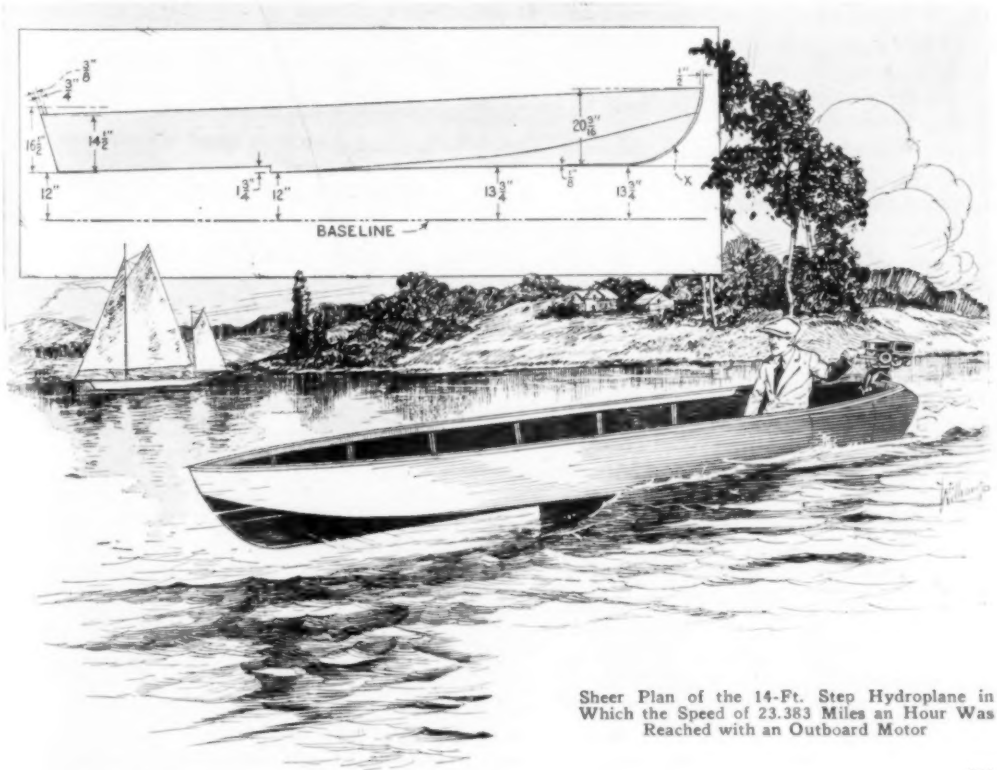
If the lamp does not glow when the rheostat is turned on to full capacity, the tube is not good. Should the lamp glow before the rheostat is turned on fully, the quality of the tube may be measured by the amount necessary to turn on the rheostat before the glow becomes visible.



Twenty-Three Miles an Hour from Your Outboard Motor

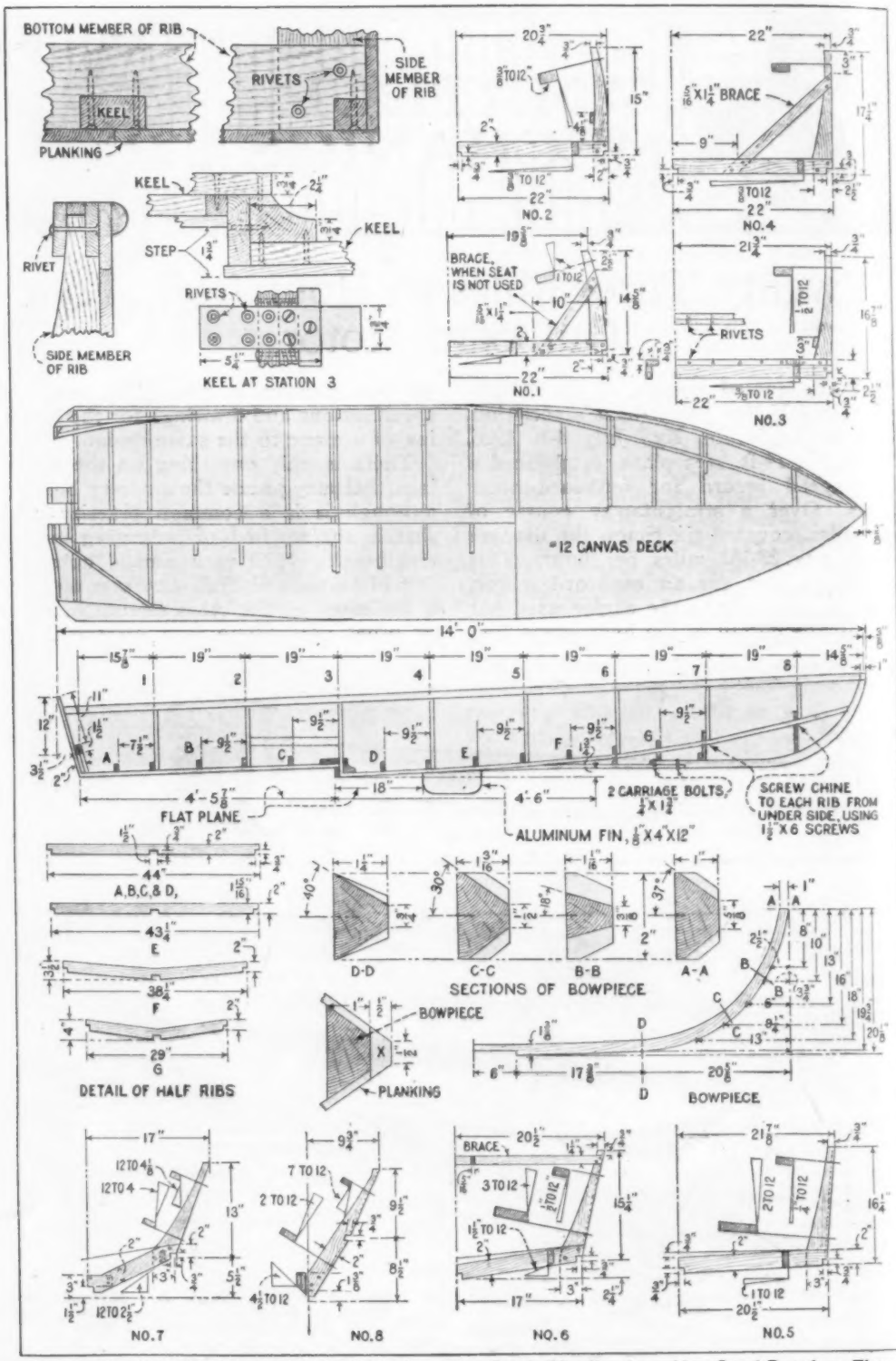
AT the annual regatta of the Mississippi Valley power-boat association, held at Louisville, Ky., July 4-6, 1926, "Whiz," a 14-ft. step plane, established a new speed record for outboard-motor boats. Over a straightaway course of six miles, covered six times, the average speed was 23.383 miles per hour. This startling speed, for an outboard motor, was due not only to the engine used but also to the design of the hydroplane, and we take pleasure in presenting complete specifications and drawings for the building of a plane to the same design.

There is only one thing on the drawings that may puzzle the amateur builder, although it is a common practice, and that is the method of indicating angles and bevels. It is very simple, however. It will be noticed that, wherever a bevel is indicated on the cross section of a rib or other part, there is a little triangle



Sheer Plan of the 14-Ft. Step Hydroplane in Which the Speed of 23.383 Miles an Hour Was Reached with an Outboard Motor

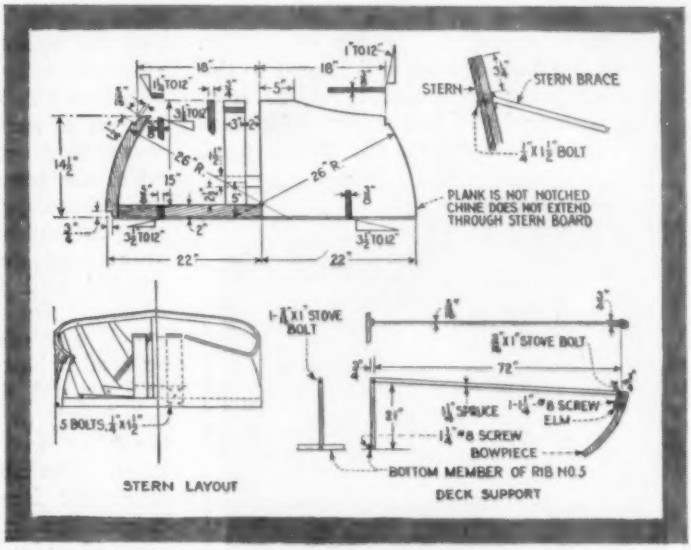
Courtesy Johnson Motor Company



Constructional Details of the Hull of the Hydroplane; Any Boatbuilder Can Assemble a Speed Boat from These Plans, and Even the Amateur Will Not Find It a Difficult Task

close to it, with the figures 1 to 12 in., or similar figures. This simply means that if a right-angled triangle is drawn, the sides adjacent to the right angle being, respectively, 1 and 12 in. long, the side opposite the right angle is at the exact angle of the desired bevel. The method is similar to that used to indicate the steepness of a hill, when we say it has a grade of 1 in 100.

The ribs are of spruce, ½ in. thick, with the exception of the bottom member of rib 3, which is ¾ in. thick; all are to be sawed to shape, notched, beveled and assembled according to the drawings. Side and bottom members are joined by copper rivets, and fastened at the proper stations to the keel by two 1½-in. No. 6 screws through each.



Layout of Stern, Showing Frame and Bracing; Right, Support for Canvas Deck, Which Extends over Forward Part of Hull

The keel is of spruce, ¾ by 1½ in., and is in two lengths, one running from the stern to the step, or station 3, and the other from step to bowpiece. The joint at the bowpiece is fastened with two ¼ by 1¾-in. bolts, spaced on 3½-in. centers.

The bowpiece is of rock elm, 2 in. wide, 1⅜ in. thick at joint, tapering to 1 in. thick at sheer line. It is in one piece, properly beveled and steam-bent.

The stern is of cedar, ⅜ in. thick, sawed to shape and nail-fastened (clinched) to the stern frame, which is of ⅝-in. spruce.

Chines are of spruce, ¾ in. square, each in two lengths, running from stern to station 3, and from station 3 to bowpiece. They are screw-fastened to each rib and half rib, using 1½-in. No. 6 screws.

Seats are of ½-in. cedar, 12 in. wide, resting on, but not fastened to, spruce cleats, ⅝ by 2 in. in size, screw-fastened to ribs 2 and 3.

The gunwales are of 5/16 by 1¼-in. spruce, notched in ribs at sheer line to receive planking. Inwales are also of spruce, ¼ by 1¼ in. in dimensions, riveted to ribs and gunwales, as shown in the detail drawing. Battens are of 5/16 by 1½-in. spruce. There are two on each side and four on the bottom.

Planking is of ¼-in. cedar on sides and bottom, screwed to ribs and half ribs and nailed (clinched) to battens, three planks on each side and six on bottom. The flooring is of ⅜-in. spruce; two pieces, 4 in. wide, run from stern to station 3, spaced 2 in. apart, and one piece, 4 in. wide, runs from station 3 to station 7. All are nailed to the bottom members of the ribs. The sheer line extends ¼ in. above the top of the ribs, and a ¾-in. half-round spruce molding is screwed to the outside of the planking at the sheer line as shown in the detail drawing.

Glue all joints in the frame, also glue the planking to the battens, stern, keel and bowpiece, using Jeffrey's marine glue, C quality. Keep all nails flush and putty all screw heads in planking. The frame is given one coat of good spar varnish after assembly, and the planking one coat before fastening to the frame. After the planking is in place, the entire outside of the hull is given two coats of spar color varnish.

A deck, made of No. 12 canvas, is fastened under the gunwales, extending from the bow to rib No. 5. It is supported at the center by the spruce stringer shown in the detail at the lower right-hand corner of the illustration on this page.

Hotbed on Porch Roof

Here is a hotbed that will appeal to the small gardener or flower lover, as it is distinctly novel and has many useful features. It is located on the porch roof,

Hotbed on Porch Roof Is Convenient and Out of the Youngsters' Reach

within easy reach from the windows, and is covered with a single sash, which is hinged at the lower side so that it can be raised conveniently, chains being used to prevent it from being opened too far. The bottom of the hotbed is covered with metal, and special shallow boxes, about 3 in. deep, fit in under the glass during the flowering season. Where possible, such a hotbed should be placed on a south-sloping porch. The only precaution necessary is to see that there is enough space between the glass and the bottom to provide room for shallow boxes and to give several inches of space for the growing plants. Such a hotbed is also entirely out of reach of youngsters who often have the habit of taking flowers.—Dale R. Van Horn, Walton, Nebr.

Kinks for the Auto Painter

The auto owner who attempts to paint his car for the first time will likely make the mistake of applying the varnish to the body of the car first. This is going at it backward. The first step is to remove such parts as the hood and the headlight rims. These can be suspended from the ceiling and painted at any time. The next step is to clean and dress the top and the upholstering, for, if this is done after the body is painted, you are sure to do a bad job, because a drop of top dressing on a varnished surface will leave a mark that cannot be removed easily. After the top has received attention, the inside fittings of the car, such as steering-post column and instrument board, brake and gear-shift levers, should be painted and then the wheels and the chassis. For the outside of the body, which is painted last, a new brush should be used if best results are to be obtained, and an old fine-tooth comb should be kept handy to smooth out the hairs of the brush as well as to remove any loose hairs. The above is a good way to remove dirt from the brush, as dipping it in gasoline might result in an uneven coat of paint. Blow the dust and dirt from the cracks and corners of the car with the tire pump before starting the job. This may prevent the finished job from having that disgusting "stuccoed" appearance, which will be an eyesore to you as long as the job lasts.—Glen F. Stillwell, Collinsville, Ill.

Server for Butter Chips

In small restaurants it will be found convenient to bend the two end prongs on an ordinary fork to make a butter server. The two prongs are bent backward and can be hooked over the edge of the bowl, as shown in the drawing, which makes the server readily accessible as well as sanitary. —F. Minter, Milwaukee, Wis.

Handy Bag Holder

To hold a bag in place while filling it with apples, vegetables, etc., drive four strong nails into the top of an empty barrel having both ends knocked out, and hang the bag inside of the barrel with the upper edge caught evenly on the four nails. The bag can easily be filled, the

top unhooked from the nails and tied up, while the barrel holds it. Remove the barrel and the bag is ready to be taken away. If the contents are to be weighed, first place the empty barrel and the suspended bag on the scales, fill the bag, lift off the barrel and weigh the bag.—Mrs. A. K. Hinkley, Rowley, Mass.

Cleaning Soiled Steel Engravings

Many persons have old-style steel engravings that have become soiled through exposure to the dust and air. To clean them, the following method will be found effective and non-injurious to the print: Prepare a weak solution of chloride of lime and carefully soak the engraving in it until white. Then rinse thoroughly by an immersion in clean running water for several minutes. Steep for half an hour in a flat enameled pan filled with water, in which has been dissolved just a little hyposulphite of soda. Rinse again in clean water and dry between clean white blotters under pressure of weights, or in a press. The result will be an engraving as good as it was originally.

Baby Carrier for the Car

When riding in the rear seat of a car it is quite difficult to hold a baby comfortably, but by providing a carrier the trouble will be eliminated. The carrier shown in the drawing consists of a canvas bag, the open top of which is held rigid by a wood or metal frame. Lengths of brass or galvanized chain and two coil springs, to serve as shock absorbers, are attached as indicated, and the baby will be safe and comfortable. To prevent the crib from lurching, it should be fastened to the back of the front seat near the bottom by means of a short coil spring. —Carlton Groat, The Dalles, Oreg.

Simple Baby Carrier Hung behind Front Seat Is Safe and Comfortable

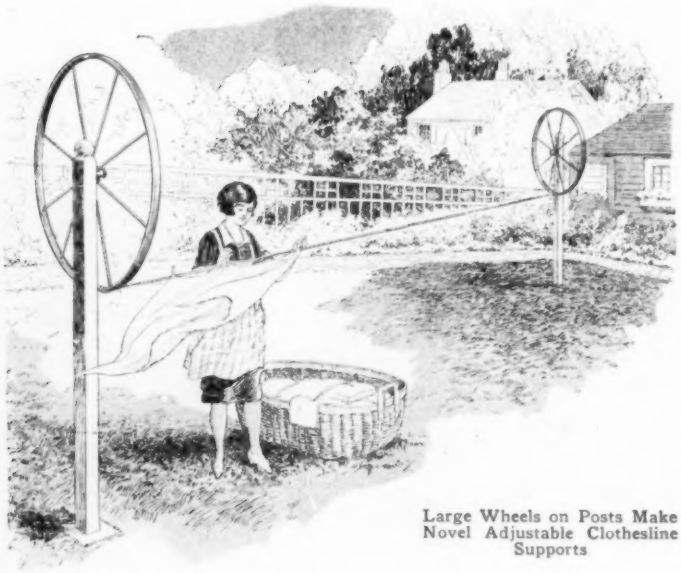
Hand Spray Used Effectively for Moistening Clothes to Be Ironed

Hand-Spray Clothes Sprinkler

Clothes can be dampened for ironing with a small hand pump of the kind used to spray liquid for killing insects. Fill the container with water and proceed as illustrated. The cloth will be moistened by an even distribution of water.

Attaching Hose to Air Pump

When attaching a rubber hose to an air pump vulcanize the rubber to the metal, to make the connection air-tight. Heat the metal until it is quite hot, force the rubber tubing on and clamp it tightly for a few minutes. The rubber will be softened by the heat and will adhere to the metal, making a much tighter connection than can be had by using a clamp alone. If the metal is roughened with a coarse file, the rubber will stick still better.

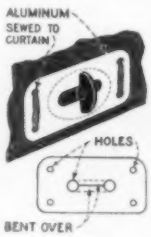


Large Wheels on Posts Make Novel Adjustable Clothesline Supports

Adjustable Clothesline

Two old hayrake wheels, mounted on posts from 20 to 50 ft. apart, make useful, adjustable supports for a clothesline. After the clothes have been hung on the line, the wheels are turned one-half of a revolution to raise the line. A bolt or hardwood pin is pushed into a hole drilled in each post, to hold the spokes of the wheel securely and prevent it from turning. The wheels are approximately 5 ft. in diameter, which permits the line to be raised so high that even long garments will be out of the reach of dogs or children. The posts should be set firmly in the ground and the wheels attached by means of bolts run through the hubs. A large washer should be placed over the end of the bolt to prevent it from being pulled through the hub.—Dale R. Van Horn, Lincoln, Nebr.

Ford Curtain Fasteners

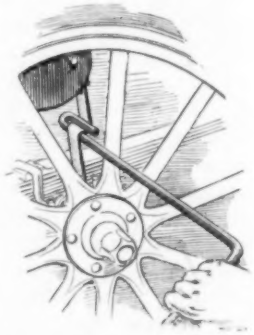


Ford tops and curtains can be repaired, if the curtain fasteners are torn out, by the use of a metal plate, preferably aluminum, about 1¼ by 2 in. with the ends cut round and a small hole drilled in each corner. The fastener is mounted in the center of the plate by drilling two holes for the prongs on the fastener and clinching them on the back side. The plate is sewed to the top, as shown, with the fastener projecting through the hole. The sharp edges are filed down and the plate should be well sewed in place so that it will not shift and cut off the thread.—E. T. Gunderson, Jr., Humboldt, Ia.

Remedy for a Rattling Gear-Shift Lever

If the gear-shift lever on your car tends to vibrate and rattle when the car is in motion, a simple remedy is as follows: Drill a small hole through the lever, about 2 in. above the floorboards or above the rotating joint in the base of the lever. Then fit a stiff spiral spring around the lever, press the top end down until it is below the hole, and insert a long cotter pin through the latter to hold the spring down.

Reinstalling Shock Absorbers of the Strap Type



With the tool shown in the drawing, it is an easy matter to remove and reinstall strap-type shock absorbers without the laborious process of lying on the floor and pulling the belt by hand. The tool is made from a length of ½-in. round stock, about 46 in. long, bent at right angles about 8 in. from one end. The other end is bent to form a hook, 2 in. long. In use, the tool is inserted between the spokes of the wheel, as indicated, and around the strap; it is turned around to wind up the strap, which prevents it from going into

the shock absorber. If disk wheels are used on the automobile, the tool is hooked over the strap in the opposite way, from the inside.—E. V. Willis, Springfield, Mass.

To Prevent Leaky Valves

Leaky and improperly seated valves are sometimes caused by jamming or screwing them down too tight. Particularly in adjusting carburetors, the novice may make this mistake and ruin the valve. A valve or faucet should not be forced, but should be carefully closed and never fully closed when the valve seat is warm. This also applies to a gasoline blowtorch valve, for the contraction of the seat and valve, upon cooling, will ruin the latter. Turn the torch down until only a tiny blaze remains, and then blow this out. This will prevent jamming the valve, and as soon as the torch cools, the valve will be found to be snugly closed.

Flashlight Makes Red Lamp

One photographer devised a satisfactory red lamp by using an ordinary hand flashlight. The lens was removed, the reflector was blackened with India ink, which can easily be washed off with water if need be, and a piece of heavy photographic film, which had been dipped in red dyeing solution such as is used for coloring electric lamps, was placed under the lens. The lamp is light and portable. The film can be dyed other colors to meet varying conditions; a certain shade of green, for instance, for use with panchromatic films, light red or orange for working with printing papers, etc. If a very deep red is desired, this can be obtained by using several thicknesses of dyed film.

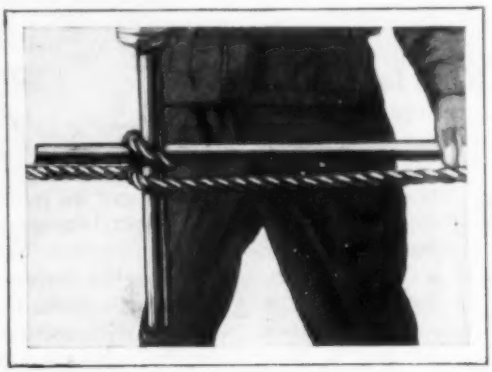
Combination Garage and Summer House

A two-car garage on an Iowa lake has been made to serve as a little summer house, where the family can sit and read or look out over the lake. Four concrete pillars were built on top of the garage, and a roof, floor and railing provided. Aside from its great economy, the height of this summer house has the advantage of giving a better view.

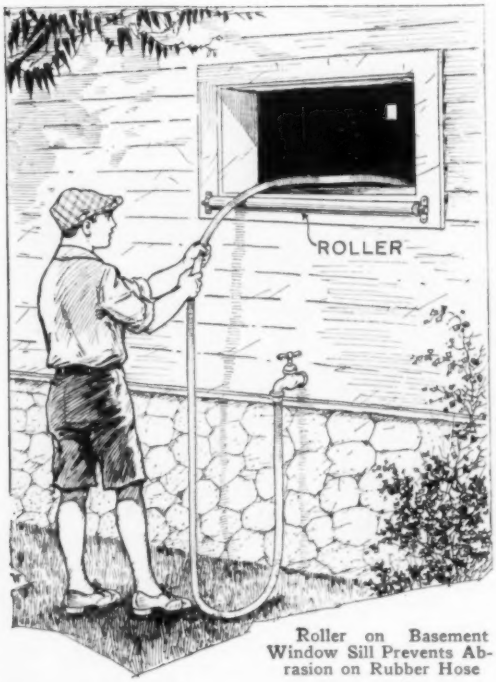
Novel Summer House on Iowa Lake Built on Top of Garage Gives Better View of Landscape

Making an Emergency Windlass

The photo shows an improvised windlass, which is useful in an emergency. A rope is fastened securely to the two objects between which the force is to be applied. Two heavy rods or pipes are held by the side of the rope, one vertically and the other horizontally, and a hitch is taken around the two as shown. Considerable force can be exerted by turning the horizontal rod, winding the rope around the vertical one. This method may be used to pull an auto out of a mud hole, if a telephone pole or a sturdy fence post is handy for use as a "deadman."



Considerable Force Can Be Exerted with This Improvised Windlass

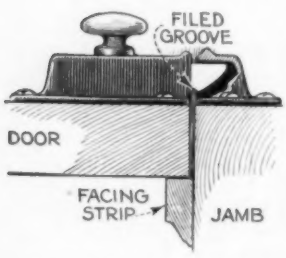


Roller on Basement Window Sill Prevents Abrasion on Rubber Hose

Roller Guard Prevents Abrasion of Hose

Needless abrasion of rubber or fabric hose, caused by dragging it through basement windows or other openings in buildings, can be avoided by means of rollers, which are made by slipping a piece of ordinary iron pipe over a rod, and are mounted both inside and outside the window, and projecting a little above the sills. If the construction of the opening through the building permits, the bar can be set in two drilled holes, while, if only a window-casing edge is available for supporting the roller, the ends of the center rod can be held by U-shaped clamps.

Burglar-Proof Night Latch



It is possible to pry a sharp blade between the edge of a door and the jamb and open a night latch, but this will be impossible if a groove is filed across the edge of the tongue, as shown in the drawing. Should anyone attempt to insert a knife, the point will catch in the groove and the tongue cannot be pushed back. Besides doing this, it is advisable to provide strips of sheet metal on the edge of the door and jamb to prevent the wood from being cut away at this point by thieves bent on gaining entrance.—Thos. H. Duffy, Juniata, Pa.

Emergency Clock Key

Having broken a clock key, an autoist took an old inner tube valve and made a new one. The U-piece and nut were left on to serve as a handle, but the core was taken out. The square, pointed end of a file was driven into the open end, until it was expanded to fit the winding stem. Skate keys can also be made in the same way.—Arthur Flinner, Manhattan, Kans.

Handy Chimney Ladder

It is often difficult to reach high chimneys and in case of a chimney fire this may lead to serious consequences. With this in mind, the caretaker of a church at Missouri Valley, Iowa, made a special ladder, which he bolted to the chimney. This installation is handy, as the chimney is of considerable height and the roof so steep that an ordinary ladder could hardly be used, especially during winter when the roof is frequently covered with snow and ice.

Homemade Fire Extinguisher

A thoroughly dependable fire extinguisher can be made at little cost. Get a small acetylene-gas tank, such as is used to supply illumination for motorcycles. Remove the valve and gauge from the ends of the tank, then, with a rather stiff wire, bent to form a hook at one end, fish out the asbestos filler. This may seem a tedious job but keep at it until you are sure every crumb is dislodged. A power-

ful stream of water from a hose often will wash away large pieces. When the cylinder is thoroughly clean, get a large valve from a discarded inner tube and thread the stem to fit the end from which the pressure gauge was removed. Into the other end, screw an ordinary brass valve of the type used to drain water from automobile radiators, and, if you wish, a short length of copper or brass tubing may be soldered on to this for a nozzle. Make sure that the tank is air-tight, then buy a 5-lb. can of carbon tetrachloride from the druggist, and pour the contents into the prepared cylinder. Any of the standard preparations sold to refill fire extinguishers may be used; you will find carbon tetrachloride an excellent substitute. Then go to an auto-service station and pump the tank up to the highest pressure the service station compressor is set for. You need have no fear about doing this, as the tank is tested for 250-lb. pressure, so it will easily stand up to 100 pounds.—Walter Briggs, Poughkeepsie, N. Y.

Quick Method of Cleaning Typewriter with Compressed-Air Spray Outfit and High-Test Gasoline

Spray for Cleaning the Typewriter

With the homemade apparatus shown in the photo a typewriter may be cleaned and dried in half an hour. A 12-in. length of ⅛-in. copper tubing is flattened at one end, and a 5-in. piece, similarly flattened, is bent to form a blunt curve. The latter piece is soldered to the former, as shown in the detail, to form a double jet. A length of rubber tubing is pushed over the end of the short piece and the other end of the tubing is submerged in a jar containing high-test gasoline or other cleaning fluid. Attach the end of the other tube to a compressed-air line at a garage. The strong spray will clean the typewriter quickly. After cleaning, the tube is removed and the air is used for drying. As gasoline fumes are highly inflammable one should keep away from any open flame while doing the cleaning.—Warren E. Crabtree, Milton, Oreg.

Safety Stop on Morris-Chair Back Rest

Often, when it is least expected, the rod which is used to adjust the angle of inclination of a Morris-chair back rest, will slip out of its notch, letting the back of the chair fall. This not only mars the furniture, but may cause injury to the person who is about to seat himself in the chair. A safety stop to prevent such accidents can be made by putting a screweye in the end of each rest support and stretching a piece of doubled picture wire between them, as shown in the illustration.—K. M. Coggeshall, Webster Groves, Mo.

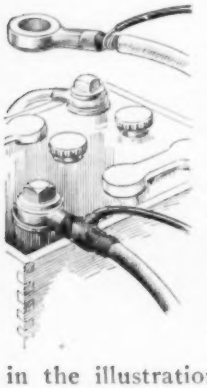
¶Razor straps should be scraped and cleaned every month or so, to keep the leather from filling up with dirt; put a little soap suds on the strap when using it, to get good results.

Tool for Removing Lamps from Ceiling Fixtures

When putting new lamps into fixtures attached to the ceiling, a step-ladder is usually necessary. However, by rigging up the simple device shown in the drawing, the lamps can easily be removed and replaced from the floor. It consists of a 5-ft. stick, to the end of which is attached a piece of corrugated cardboard, formed into a cylinder the inside diameter of which is a trifle less than the diameter of the lamp. To strengthen the holder it may be bound with tape. A few carpet tacks are used to fasten it securely to the end of the stick. In use, the holder is pushed over the lamp to grip it firmly and by turning the stick the lamp can readily be put in or removed.—Henry J. Smith, Montreal, Can.

Wiring Accessories to Storage Battery

Frequently when connecting spotlights, horns, stop signals and other electrical devices to the storage battery of a car, the wire is brought under the terminal nut of the battery. This method is, however, rather unsatisfactory as the small wire soon corrodes from the action of the sulphuric acid, and each time the battery is disconnected it is also necessary to disconnect the extra lead. A more satisfactory way is shown in the illustration. The storage-battery cable is bared and the wire twisted around it and soldered. The joint is then taped and shellacked. This makes a durable and permanent connection, which will not be affected by acid and does not interfere with the easy removal of the battery.—G. A. Luers, Washington, D. C.

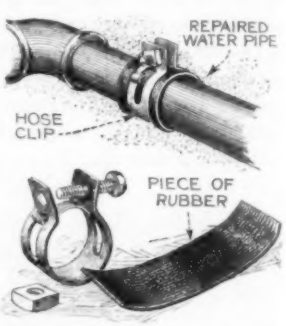


Protection for Radiator Core

Ford radiator cores, of the type used from 1917 to 1923, are often worn through on top by friction of the shell at the rear edge. It is important to keep the fabric strip, which is threaded through the rear edge of the shell, in good condition, and to replace it if it becomes hard or cut through in places. The reason for this is that the fabric keeps the shell from wearing the core and also prevents rattling and squeaking of the hood.

Repair for Water-Pipe Leak

If the water pipe springs a leak during the night or on Sunday, when plumbers are hard to locate, emergency repairs can be made with a garden hose clip and a piece of rubber, cut from an old inner tube, as shown in the drawing. The hose clip is placed so that one of the metal strips fits over the hole, otherwise the water pressure will stretch the rubber until it bursts. Such a repair, while intended only as an emergency remedy, may last for a long time.—Ivan E. Houk, Denver, Colo.



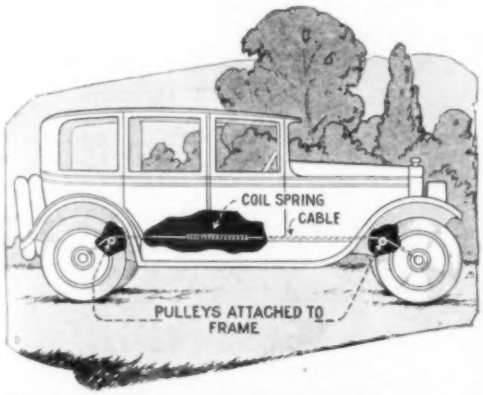
Holes for Seat-Cover Fasteners

The better grade seat covers are attached to closed cars with wood screws having ball heads for glove fasteners in the seat cover. An ordinary small twist drill should be used in drilling the small holes for starting the screws, as the screwdriver slots in the heads are too small to allow them to be driven directly into the average wood frame. There is a layer of soft filling, much like cotton batting, under the upholstery cloth, and

in starting the screws, the filling has a tendency to catch on the drill and wrap about it. This injures the upholstery and makes the screws difficult to start. The holes should be drilled with a forward and backward motion, one turn forward and a quarter turn back. The cotton will not stick to the drill and yet the drill will quickly sunk into the wood.—E. T. Gunderson, Humboldt, Iowa.

Homemade Snubbers Prove Effective in Stopping Rebound

Rebound on rough roads is the greatest cause of broken springs, and snubbers are usually provided to offset this action. If the auto owner does not feel justified in purchasing commercial snubbers, he can make some which will be found entirely satisfactory. Obtain two strong coil springs, about 12 in. long, made of ¼-in. wire. Attach to the ends of each spring a piece of ⅜-in. steel cable, long enough to reach the front and rear axles, allowing the cable to pass over heavy pulleys attached securely to the frame, as shown in the drawing. Using cable clamps, draw the cables up so tight that the springs of the car will be slightly compressed. The coil springs should be located in the center of the car just behind the running-board apron, and care should be taken to get them in alinement. These snubbers will absorb side sways as well as the vertical rebound of the car,



Homemade Snubbers Absorb All Shocks on Rough Roads and Make Riding Comfortable

and the riding qualities of the auto will be found greatly improved.—Geo. G. McVicker, North Bend, Nebr.

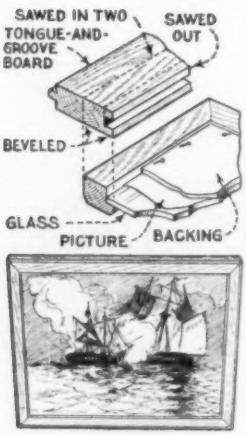
Emergency Churn for Campers Made from Inner Tube and Sirup Pail

Novel Improvised Churn

While camping out last summer, a party of fishermen found their supply of butter exhausted, and a farm house in the vicinity could only furnish a jar of sour cream. Taking this to camp, one of the party improvised a churn, which provided fresh butter in a very short time. He set the jar of cream in a near-by spring, cut a discarded inner tube at the valve section, tied one end to a low branch of a tree and stretched the tube so that the opposite end could be tied to a peg in the ground. The tube was then slit in the center to receive a ½-gal. sirup pail with a tight-fitting lid. A hole was punched in the cover to receive a cork and the churn was ready for use. It was operated by grasping the inner tube above the pail and pulling it up or down, and letting it rebound. The cork was removed occasionally to allow the gas to escape.

¶Registers are hard to clean with ordinary brooms, or the like, and a good method of cleaning them is to use stove polish on a rag; this enables you to reach the corners and do a good job.

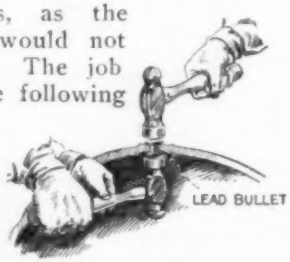
Making Picture Frames



Very good picture frames can be made from tongue-and-grooved lumber. Saw the lumber the desired width, measuring from the grooved edge. Cut away one side of the groove. Then plane the surfaces and finish with fine sandpaper. This gives a stock of picture-frame molding from which attractive frames can readily be made.

Leaks Stopped with Bullets

Recently an open-top water tank sprung a leak where the iron had been eaten away by rust. I tried soldering, but without success, as the rusted surface would not take the solder. The job was done in the following way: A lead bullet from a .32-caliber cartridge was inserted into the hole, which was enlarged to receive it. A hammer head was held against the bullet on the inside of the tank and the portion of it protruding on the outside was peened over with a riveting hammer as shown in the illustration. The repair shows promise of being a permanent one.—C. M. Wilcox, Torrington, Conn.



Fire Hazard in Climbing Vines

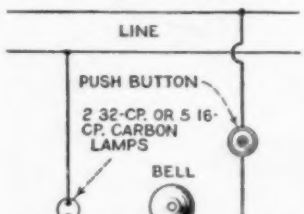
When vines are allowed to cover a chimney, which leads from a fireplace and touches a shingle roof, there is danger of fire. The vines, some of which become very dry, are easily set afire by a spark, and in one case the blaze spread to the roof. The result was that one side was damaged to such an extent it had to be entirely replaced and much more damage was caused by water. The vines should be trimmed every year and all the dry, dead branches should be cut off to reduce the fire hazard, and not allowed to climb to the top of the chimney. —John E. Mason, Hamilton, Ont.

Loose Coil Bridge Causes Spark Miss

My Ford occasioned some trouble because of a persistent miss that could not be located. The timer was examined; the plugs, coils and wiring and everything were found to be in good condition. The compression was good and the valves were reground to insure proper seating, but this did not cure the skip. One mechanic noticed that the coil bridges were loose due to improperly tightened nuts and, of course, this did not permit a positive connection. As soon as these were tightened the car operated normally. —Glen F. Stillwell, Collinsville, Ill.

Hookup for Using Doorbells on 110-Volt Lines

When a doorbell is to be operated on a 110-volt light line, it can be done by connecting two 32-cp. lamps in series with the bell and the push button, as shown in the accompanying diagram. Another way is to use only one 16-cp. lamp instead of two and bridge the two terminals of the bell with a 6 or 7-ohm resistance, an ordinary radio rheostat of this capacity or any fixed resistance being suitable for this purpose. A resistance of about 7 ohms can be obtained by winding about 25 ft. of No. 21 German-silver wire on a piece of fiber or bakelite taking care that no two of the turns touch. The ordinary doorbell will stand .1 amp. and requires 2 volts' pressure. So five 16-cp. lamps, which have a resistance of 220-ohms each, will bring 110 volts down to 2 volts and .1 ampere.



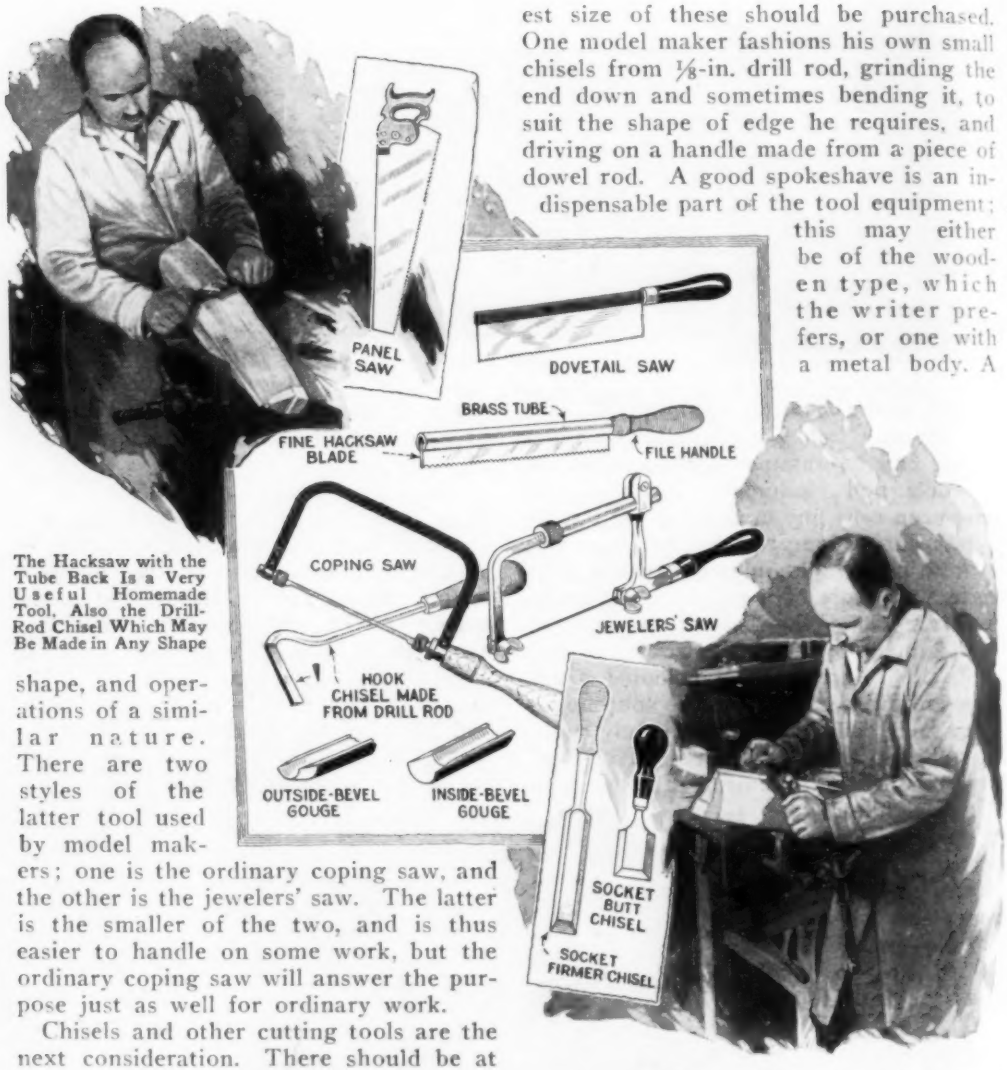
The SHIP-MODEL MAKER'S TOOLS

By James Tate

ONE of the beauties of ship-model making as a hobby is that such splendid results can be obtained with a minimum of tools and equipment. Many of us have seen very fine models turned out by sailors during long watches below at sea, with no more tool equipment than a jackknife, and made of wood from old packing cases, and the beautifully detailed models made by French prisoners of war in England during the Napoleonic struggle were often made from the soup bones from their daily rations, their only tools, also, being their jackknives. However, while there is an element of interest in the fact that a model has been made under such conditions, the amateur who wants to do really good work, as in every other line, should provide himself with tools specially adapted for his hobby. These are not many in number, nor are they expensive, but they will add greatly to the ease with which the model is constructed, as well as to the finished effect of the work, and besides, they all, of course, can be used for doing all kinds of other work as well.

If the Model Maker Glues Up His Own Hulls, Several Large Clamps Are Essential

There is ordinarily a small saw in the place, used for odd jobs, and this will do quite well for the rougher work of cutting off stock, etc., when the model is begun. If no saw is handy, the model maker will do well to get a panel saw, about 16 in. long. Then there is a small dovetail saw made that should be in the modeler's kit; this is about 4 in. long, and has very fine teeth, about 32 to the inch. Even this will be found too coarse for some work, and a still finer saw can be made from a hacksaw blade, provided with a wooden or sheet-metal back and a wooden handle. The blade should have about 64 teeth to the inch. Further, an ordinary hacksaw frame, with fine-tooth blades, is indispensable, and a coping saw, with blades for both wood and metal, will also be found necessary for such work as cutting lifts to



The Hacksaw with the Tube Back Is a Very Useful Homemade Tool. Also the Drill-Rod Chisel Which May Be Made in Any Shape

shape, and operations of a similar nature. There are two styles of the latter tool used by model makers; one is the ordinary coping saw, and the other is the jewelers' saw. The latter is the smaller of the two, and is thus easier to handle on some work, but the ordinary coping saw will answer the purpose just as well for ordinary work.

Chisels and other cutting tools are the next consideration. There should be at least one good-sized chisel in the tool kit, one about 1 in. wide. The best form is the beveled-edge socket chisel, and a paring gouge of similar size should also be obtained. The smaller chisels, ½, ¼ and ⅛-in., and three gouges of similar width, may be of the "butt" or pocket type, with a blade about 3 or 3½ in. long. These short chisels will be found exceedingly handy. For fine work, and for reaching into places inaccessible by means of the ordinary straight chisel, some bent carving tools will be found, if not essential, at least very useful. One maker puts up small carving tools in sets of six, with a variety of cutting edges, and the smallest size of these should be purchased. One model maker fashions his own small chisels from ⅛-in. drill rod, grinding the end down and sometimes bending it, to suit the shape of edge he requires, and driving on a handle made from a piece of dowel rod. A good spokeshave is an indispensable part of the tool equipment; this may either be of the wooden type, which the writer prefers, or one with a metal body. A very good form, although a little more expensive than the ordinary, is a pattern-makers' spokeshave, which can be adjusted for either straight or curved work, as the job in hand may require.

A smoothing plane, while a handy thing to have around, is not essential, since the stock can usually be obtained surfaced at the mill, but a small block-plane, about 3½ in. long, is quite necessary. These are very cheap; in fact, five planes of this size can be obtained at the five and ten-cent stores which are good enough, provided the blade is kept sharp, and this is necessary with all cutting tools, regardless of their quality. There

is a small tool used in making musical instruments, called a thumb plane, which is a very valuable one. The body of this tool is held between the thumb and forefinger, and the "handle" butts against the palm of the hand. In case the reader cannot buy one of these tools, a drawing is given so that he can make it himself. The body is preferably of beech; although any good hardwood with a fine, close grain will do, and is made in two parts, afterward doweled and glued together, for convenience in cutting and filing the small slot and wedge seat. The handle is a short piece of dowel rod, with a hardwood knob on the end. The knob may be a slice from a broomstick, rounded on top and drilled on the bottom for the end of the dowel. The blade may be ground from a piece of hacksaw, or made from similar steel. The bottom of the plane may be flat, concave or convex, for different work, and the cutting edge of the blade ground and honed to suit. The cutter should not project more than a "hair" from the bottom of the plane.

The most important of the cutting tools, after all, is the humble knife. The shape of the handle matters not in the least, nor the cost of the tool, provided the blade will take and hold a good edge. A couple of "sloyd" knives, of different sizes, are also handy, but I prefer a blade somewhat concave along its length, instead of convex as a sloyd knife is; however, that is a matter of taste. Quite good carving knives can be made from broken hacksaw blades, ground to shape and honed to a keen edge; the simplest form of handle for these is made by wrapping layers of tape around the end.

No matter what the cost of a cutting tool may be, the satisfaction it will give depends entirely on the care given the edge, since no tool is better than its cutting edge. Keep the oilstone constantly at hand and give the edge a few licks

At the Lower Left Are Detailed Drawings for Making a "Thumb Plane," in Case the Reader Cannot Buy This Useful Tool

every once in a while as the tool is used. Tools kept sharp in this way do very much better work than when they are allowed to become comparatively dull before they are sharpened. In sharpening the carving tools, finish the edges, after honing, on a razor strop, as these tools must have the very best edge obtainable, if clean cuts are to be made.

Next to his cutting tools, the modeler's best friends

The Pin Vise and the Homemade Clothespin Clamps Are Indispensable in Gluing and Drilling Small Parts; the Knife Blade Will Also Be Found More Useful When Honed to the Shape Shown

are his files. A 10 or 12-in. flat or half-round bastard file will remove a surprising amount of wood from a rough hull in a short time, and there is not nearly the danger of cutting too deeply that there is with a drawknife or chisel. It may not be good woodworking practice to use a file on work of this kind, but the model maker should not let that worry him. In addition to the large flat file, 6-in. pillar, triangular, square, and round files should be in the kit; the pillar, round and square files should be bastard-cut, and the triangular one a second-cut; an ordinary saw file is fine. These will be found exceedingly handy when making

TO THE MASTER OF THE GOODE SHIPPE "HALVE MAEN":

Dear Captain:

And now we have come to the end of the few months of shipbuilding under your masterly direction, months which should have found a grown man and a father at other things, no doubt, than bruising his fingers and cutting his mitts with planes and drawshaves, gluing the whole cellar from laundry to dog's bed with liquid cows' toenails, extracting slivers like fence rails, cussing in three languages (including Seneca Indian), when my compass steered me wrong in figuring out plans and specifications so clear that my young son could read them, but which, to me, were like the third declension of the irregular verb in Sanscrit; but at last, Captain, she stands on 'er ways as slick an' trim as the blue-eyed barmaid of the Purple Boar tavern, an'—shiver my timbers!—I'm proud of 'er!

The hours spent with my boy and dog while doing your delightful ship have been so very much worth while in the feeling of companionship and understanding which has come to the boy and me as a result of our mutual interest in this ship and its making, I find double return for any trouble and labor. That alone is pay enough, indeed, but that is not all, for we have learned many things that were mysteries; the way of ships, the meaning of many strange salty terms and expressions which fascinate boys and old boys as long as they live, and the knowing and understanding of which give a new flavor to tales of the sea. Lanyard, crow's nest, gammoning, belaying pin, lubber's hole, crow-foot—they meant nothing to us before, but now, when we read of a sailor on the foretop's'l yard, we see that tar and know he isn't down in the foc's'le . . . . . The busy professional man like myself I advise, without charge, that he take his boy and his tools, go down to the cellar with those copies of P. M. and learn many worthy things. It will teach him patience, perseverance—and his boy, and when he has 'er done, and the lady of his heart who dwells upstairs pats her two boys on the head and says, "It really looks just like the pictures Mr. Miller made of his ship; put it on that table near the window," he'll feel so darned proud and so thrilled with the feeling of having seen the thing through that he'll no doubt do just what I have already done—start two more.—Dr. E. W. Flagg, Auburn, N. Y.

small parts, especially by the man who is not any too sure of his control over small chisels. In addition to these, a set of needle files should be obtained. These need no handles, and come in seven or eight different shapes; if these cannot be obtained easily, get die sinkers' files. The latter are somewhat similar to the needle files, but are used with small handles. Don't use a rasp instead of the large rough file; the latter will take off almost as much stock in the same time as the rasp, but will leave the work in much better shape for subsequent operations.

As for drills, about the largest ever used for model work is ½ in., and one each of the ½, ⅜ and ¼-in. sizes should be all that is necessary in the fractional sizes. In the wire sizes, the worker should buy a set numbered from 1 to 60, and a couple each of the No. 65, 70, 75 and 80 sizes. To hold the drills, one of the small hand drills sold for radio work is ideal, except for the ⅜ and ½-in. drills. For the small drills, from No. 60 up, and when drilling delicate work, such as futtock holes in crosstrees, get a pin vise from a jewelers' supply house, fasten a drill in it, and drill the hole by twirling the vise with thumb and forefinger.

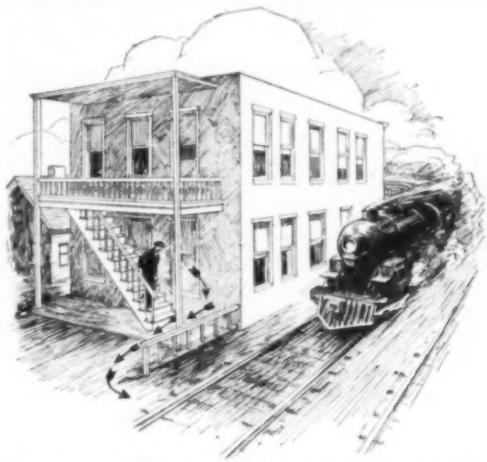
There will usually be a claw hammer around the house, and for the infrequent occasions on which a large hammer is necessary this will serve nicely. There is far more occasion for several small hammers. Get an 8-oz. ball-peen hammer, a 5-oz. tack hammer and a 7-oz. adze-eye hammer with a long nose and claw, somewhat like an upholsterers' hammer, and you will be well equipped. These need not be expensive, since the work they are called on to do is very light. The writer has some hammers of the kind mentioned that cost only ten cents a piece, and has been using them for years with satisfaction.

Among the miscellaneous tools that will be found handy around the bench are a good square, with at least an 8-in. blade, an awl, a pair of good small tweezers, a crochet hook, and a number of small clamps. The crochet hook seems rather a peculiar "tool," but it will be found very handy in rigging. Among the clamps should be several sizes of small C-clamps; also, if possible, at least two, opening 6 in., known as carriage clamps, and two regular wood clamps. If you can get a cabinetmaker to glue up your hulls, the large clamps will not be necessary, but the small clamps are essential. Very good clamps for light work can be made from ordinary spring clothespins, the jaws being cut into several different shapes to suit the work.

The individual can add to this stock as he progresses and finds that he needs one or more tools of a size not specified. There are some tools not mentioned that may be preferred for certain work by some modelers, such as a drawknife, and, of course, one needs an oilstone and oil slips for sharpening chisels, gouges, etc., as well as sandpaper of different grades for finishing work.

Safety Fence Prevents Railroad Accidents

In many towns railroads run close to buildings, and to reduce the number of

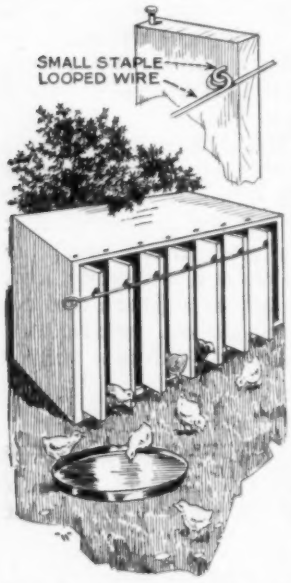


Fence at the Bottom of Stairway Minimizes the Risk of Railroad Accidents

accidents, a safety fence of the kind shown in the drawing will be found effective. When coming down the stairs behind the building a person may not hear or see an approaching train, and unless there is some barrier, he is apt to walk from the steps directly onto the track. A railing, about 3 or 4 ft. high, can be built at the bottom so that a person descending the steps is compelled to follow the route indicated by the arrows, which gives him time and opportunity to see whether or not the track is clear.—J. S. Hagans, Chicago, Ill.

Protection for Chicks in Brooder Coop

Brooder coops for chicks are usually made by nailing lath at intervals across the opening of a box. This however, necessitates the use of screens or boards to close the openings to exclude rats and mice, and prevent the young chicks from getting out too early in the morning. To overcome the extra trouble of propping boards or screen against the coops every evening is a simple matter if a few minutes more are spent at the time the coops are made. Strips of lath are cut to fit between the top and bottom of the open front of the coop, and nails are driven at the points indicated to serve as pivots upon which the lath can turn in the same manner as window shutters. A length of wire is bent to a loop at each lath and staples are used to attach the wire as shown. By moving the wire back and forth the shutters of the coop can be opened or closed. No large door is necessary at the front, as the coop is bottomless. This permits the removal of the mother hen when necessary to move or clean the coop.—G. E. Hendrickson, Argyle, Wis.



Equalizing Rear-Wheel Traction

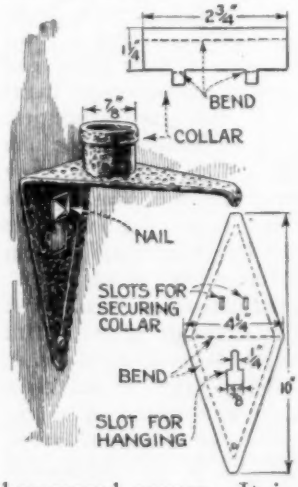
Owing to the differential action of automobile rear wheels, the driver is sometimes at a loss what to do when stuck in a muddy or sandy rut. The trouble is that one wheel provides traction and the other one does not. In many cases one could easily get out without being hauled out by some one, if only the traction of the rear wheels were equalized. This can be done by simply pulling the emergency brake back just far enough to drag on both wheels, which will make them work evenly. This is only of use, however, where the emergency brake operates on the rear wheels, and is of no value when it operates on the transmission.—E. R. Haan, Chicago.

Hint on Varnishing

In varnishing, the worst trouble is the collection of dust on the treated surface. Any amateur painter can do a good job, however, by observing the following directions: First, a new brush should be used and this be cleaned by tapping it on the palm of the hand to romove loose bristles and dust; then scald the brush in boiling water to soften it and finally let it soak in gasoline for about two hours; after sandpapering the article to be varnished, the surface is carefully cleaned with a rag. Then apply the varnish and let it dry hard. Dust that collects after varnishing may be removed with a paste of pumicestone and oil rubbed with a piece of heavy felt. A fine job will result.

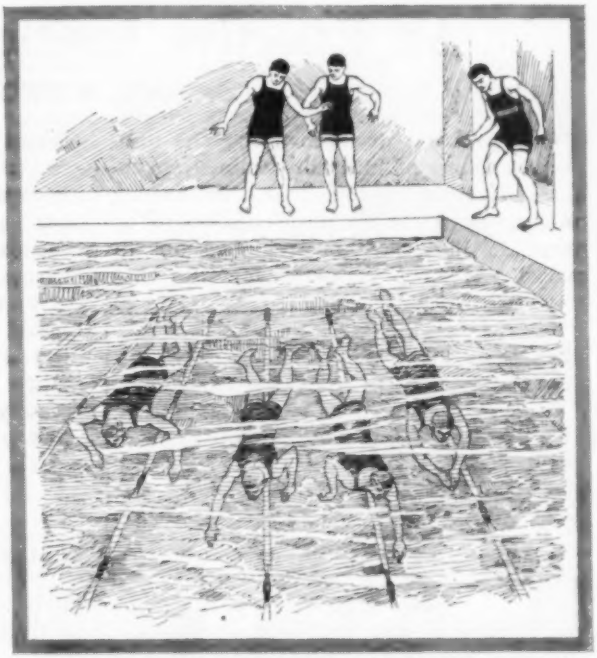
Homemade Colonial Candle Holders

Decorative candle holders of the colonial type are easy to make and cost very little. They consist of a flat piece of bronze or sheet iron about 1/16 in. thick, cut to a diamond shape, as indicated, and bent at right angles, with a small collar to hold the candle. The forge marks are produced by hammering it irregularly, holding the hammer slightly tilted. To match the holder, the head of a large nail is flattened and hammered square. It is driven into the wall so that the holder can be slipped on easily.—G. A. Luers, Washington, D. C.



How to Remove a Stuck Rag from Gun Barrel

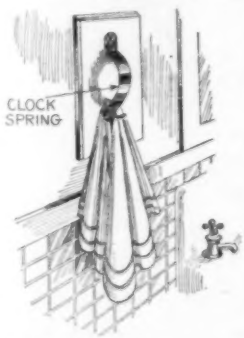
A rag that has become lodged in a small-caliber rifle barrel during a cleaning operation may easily be removed in the following way: Measure the gun barrel and get a piece of stiff wire a little over half its length after allowance has been made for a loop at one end. Fashion and sharpen the other end like a crochet hook, so that it will easily pierce the cloth wedged in the rifle. If the end of the cloth cannot be reached, get another piece of wire and split the end with a chisel instead of making a single point. Sharpen these ends and make a few nicks in the ends of both with the punch so that the wire will cling to the rag when the wire is twisted. No matter how firmly the rag sticks, the jagged edges will get such a good hold that it can be pulled out.



Lengths of White Tape Serve as Guide Lines in Underwater Swimming Contest

Clock-Spring Towel Clip

Towel clips can be made in a few moments from pieces of old clock or phonograph springs, as shown in the illustration. One end is straightened and drilled to receive two or three small wood screws, with which it is fastened to a wooden base. The other end is turned over as shown, so that when a towel is pushed under it, the spring will grip it securely, but still allow it to be pulled away.—E. A. Goering, Langenburg, Can.



Lines Guide Underwater Swimmers

When several persons dive at once for an underwater swimming race, they are likely to collide and interfere with each other because of their inability to see the course clearly. This trouble was overcome at one club by marking white guide lines at the bottom of the pool. A number of lengths of white tape, of the kind used in marking tennis courts, were provided, each being as long as the course. Heavy lead fishline sinkers were fastened to the tape at intervals of 6 or 8 ft. and the tape laid along the bottom in a straight line from the starting to the finishing line. The tapes are spaced far enough apart to prevent interference.—L. B. Robbins, Harwich, Mass.

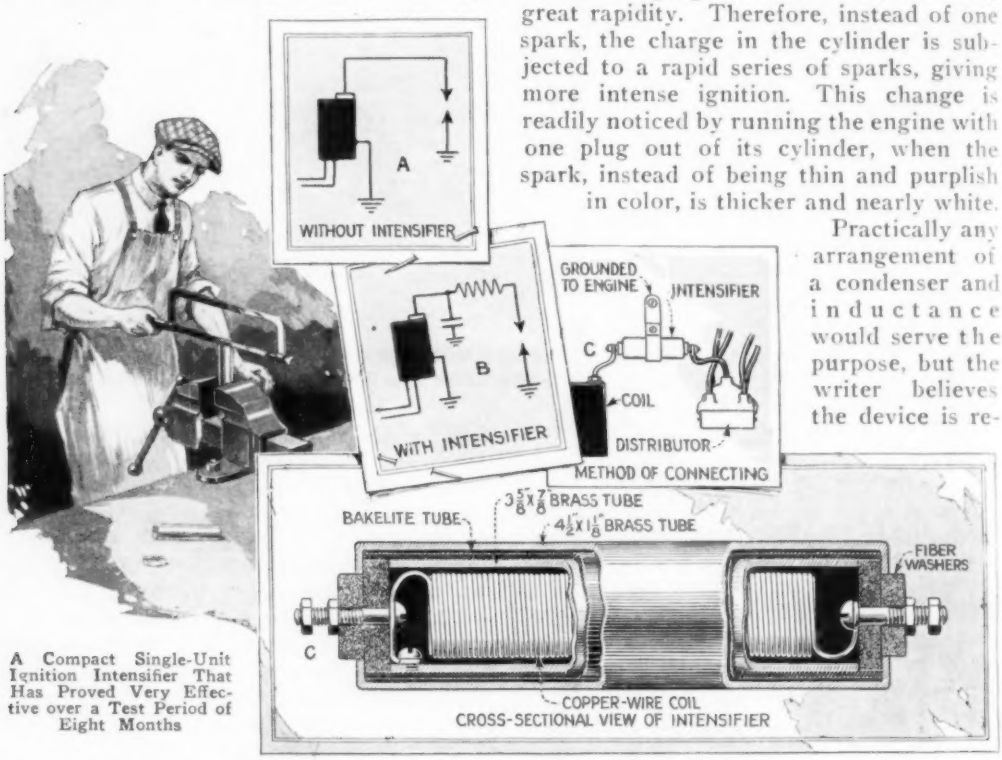
Arranging Piston Rings

Although it is a well-known practice to stagger the ends of piston rings so that the joints are not in line, the attention of the amateur should be called to this most important detail of assembly, when overhauling his motor. When slipping the piston back in place, take care that the ends of the rings are not above each other for by such an arrangement loss of compression would be sure to follow.—G. C. Douglas, Raleigh, N. C.

An Effective Ignition Intensifier

By THOS. W. BENSON

THE problem of intensifying the ignition spark of internal-combustion engines has interested many inventors, judging from the numerous makes of intensifiers that have been placed on the market. Almost without exception they have been of the series-gap type, and have had their limitations. The writer considered the problem from a different viewpoint and devised an intensifier that has proved very efficient.



A Compact Single-Unit Ignition Intensifier That Has Proved Very Effective over a Test Period of Eight Months

The principle of operation may be understood from a study of drawings A and B, particularly by those acquainted with the old spark transmitters used in radio telegraphy. The ignition equipment on all cars using a breaker and distributor gives one spark across the gap each time the breaker points open. Such an arrangement is shown diagrammatically at A. Now, by connecting a condenser across the coil and an inductance in series with the lead to the distributor, and hence to the plug also, the characteristics of the spark are completely changed. The system becomes a tuned oscillating circuit, and when the breaker points open, the condenser is charged and discharges across the plug a number of times with great rapidity. Therefore, instead of one spark, the charge in the cylinder is subjected to a rapid series of sparks, giving more intense ignition. This change is readily noticed by running the engine with one plug out of its cylinder, when the spark, instead of being thin and purplish in color, is thicker and nearly white.

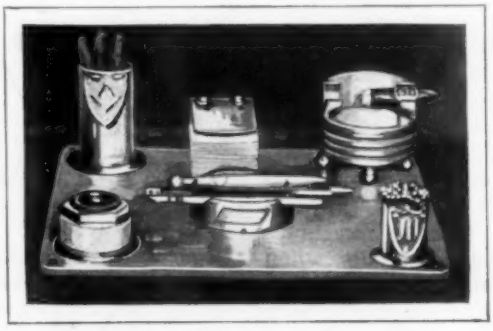
Practically any arrangement of a condenser and inductance would serve the purpose, but the writer believes the device is reduced to its simplest form by constructing it as shown in the detail drawing. Exact dimensions need not be adhered to, but are given for guidance. The outer shell is a 4½-in. length of 1⅛-in. brass tubing. The ends of this tube are slotted with a hacksaw for a distance of ¼ in. so they can be bent in to hold the assembly together. Inside the shell is a 4-in. piece of fiber or bakelite tubing, 1 in. in outside diameter with a 1/16-in. wall. The inside plate of the condenser is a 3⅝-in. length of brass tubing, having an outside diameter of ⅞ in. The large fiber washers used in the ends are ⅞ in. in diameter and the smaller ⅝ in. The writer used regular spigot washers

for the purpose. The inductance is made by closely winding No. 14 to 18 cotton-covered copper wire on a ⅝-in. mandrel until a coil 3 in. long is made. With the above parts on hand and two brass machine screws and nuts for terminals, the assembly can be started.

First slip the inductance inside the smaller brass tube, and solder one end of it to the inside of the tube or fasten by means of a screw. Bare the wire back of the soldering and wrap it around the head of the screw to be used at the left-hand terminal as shown; then assemble the two washers on the screw and bolt up tight. The brass tube with the inductance inside is then slipped into the fiber tube and positioned about midway of its length. The free end of the inductance can then be pulled out, and the other terminal, with its insulating washers, attached. It is well to identify the terminal that is connected to both the inductance and the inner brass tube with a pencil mark or file scratch, so the device will be connected properly into the circuit.

The final step of assembly is to inclose the whole in the outer brass tube. Prepare the outer shell by slotting the ends for a distance of ¼ in., spacing the slots ¼ in. apart around the tube. Bend in the strips thus formed at one end of the tube. The fiber tube should now be slipped into place, the smaller washer on the terminal extending out beyond the bent end strips of the tube. The strips at the other end of the tube are then bent over to hold the whole device together.

The method of connecting between the coil and distributor is shown in one of the small drawings. Take care that the marked terminal, connected to inductance and inner tube, and indicated by C in the illustration, is connected to the coil. A bracket holds the device on the engine and grounds it. Eight months' test has proved that it will fire any plug that is not short-circuited.



Novel Smoking Tray and Writing Outfit Made from Old Auto Parts

Kink for the Fisherman

If your fishing rod is the cause of sore ribs, provide a leather disk on the end of the handle as shown in the photo. The

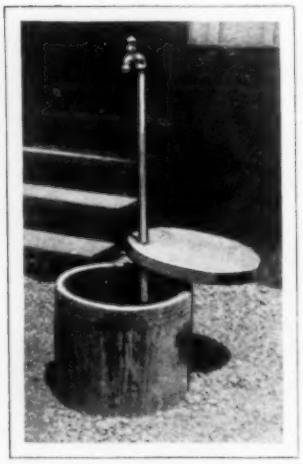
Leather Disk Attached to Fishing-Rod Handle Will Serve to Prevent Sore Ribs

disk can be cut from a piece of sole leather and is tacked or screwed to the front end of the handle.—Andrew R. Boone, San Diego, Calif.

Smoking Set from Auto Parts

A novel and handy smoking set was made from various parts of discarded cars. The cigar holder is a piece of the steering post and the end of a coil, and the monogram on it was taken from a radiator cap. A resistance-unit box was used to make the calendar holder. The ashtray is an old piston and the feet are balls taken from a bearing. The pen rack and pin tray are made from an old piston and the pen holder from an old gas line and a spark-plug cap, while the letter opener is formed from the handle of a windshield cleaner and a hood bolt. A brass dash plate and a radiator splash-pan flange were used to make the inkwell, while a water-inlet tube and a dash-lamp bracket made the matchbox. The base on which these parts stand is part of an old aluminum door.

Drain for Yard Hydrant



To prevent mud puddles around a yard hydrant, the drain shown in the photo has been found quite practical. A sewer drain, or sink, is installed directly under the hydrant, being sunk about 1 ft. into the ground, and a large tile is slipped over both. A lid will make a good stand when filling buckets.

Safe Razor-Blade Holder

The problem of disposing of used safety-razor blades so that small children cannot get hold of them may be solved by cutting a slot in the lid of an ordinary tobacco tin and soldering the lid shut. This will hold about a year's accumulation of blades and can then be thrown away without endangering anyone.

Jerky Speedometer Shows Lack of Oil

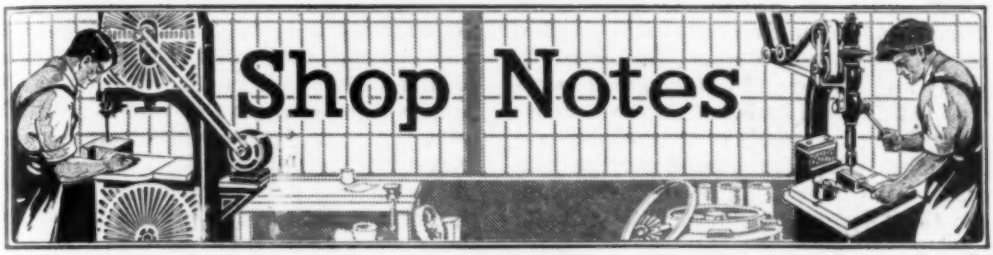
Most speedometers are driven from the transmission, and, on several popular cars, the driving gear and worm are lubricated from the universal joint. The speedometer should accelerate smoothly with the car, but occasionally it will seem to catch and swing from the correct position, registering from five to ten miles fast at each oscillation, especially when the car is being driven fast. Investigation of a number of cases revealed that it was not the speedometer drive which was at fault but that the grease was entirely gone from the universal joint due to neglect, and the friction of the gears driving the speedometer was sufficient to cause the jerking. Repacking the joint with grease restored the even movement of the speedometer, not to mention the benefit to the universal-joint bearings.

Simple Way of Regulating a Clock

When a clock is going too fast and the adjustment pin is at the extreme end of the slot toward the slow position, or vice versa, proceed to adjust the clock in the following way: Remove the back of the case and you will notice two little curb pins on each side of the hairspring. These are for the purpose of controlling the expansion of the spring. Open these slightly and then move the regulator back toward the middle of the slot. This adjustment should slow the movement down slightly and the regulation can then be made in the regular manner by the adjustment pin. Pressing these pins together slightly but not enough to bind the spring will have a tendency to increase the speed. Be careful, however, in making the alterations, as a slight opening or closing will be all that is necessary.

Crimping Stovepipe

When house-cleaning time comes and the kitchen stovepipes are taken apart for a thorough cleaning, it often happens that they do not fit snugly when again put together. This would make it necessary to crimp the ends with a tinner's tool, but as this is not usually a part of the home equipment, a substitute must be provided. A simple method is shown in the illustration. An old fork, a hammer and a small block of wood do the work. The block is used as an anvil and the prongs of the fork are pushed over and under the edge of the pipe, as shown, so that light tapping of the hammer will make the crimps in the pipe.

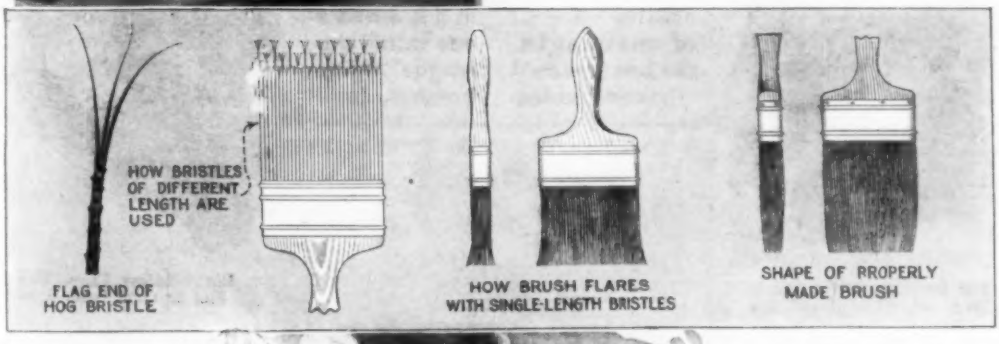


All Shop Notes published in 1926, in book form—Fifty Cents—from our Book Department

How to Buy and Keep Your Paintbrushes

By T. M. JAMES

THERE is probably no tool that the handy man around the house uses more than the paintbrush—nor one that he knows less about. He knows, of course, that there are good and bad brushes, but what constitutes a good brush is a comproblem; the average man is usually content merely to wash out the brush he has just finished using in turpentine and put it to one side, with the feeling that he has done about all that is necessary. The consequence is that the next time he needs the tool, he finds it almost useless. If it was a good, and consequently an expensive, brush in the first instance, this hits him in the pocketbook, in addition to the annoyance experienced by finding the brush unequal to the job. If it is a cheap brush, it might just as well be thrown away. We will not speak of the habit of simply leaving the brush in the paint for weeks or months, or of putting the brush to one side without even cleaning. Everyone


HOW BRISTLES OF DIFFERENT LENGTH ARE USED
FLAG END OF HOG BRISTLE
HOW BRUSH FLARES WITH SINGLE-LENGTH BRISTLES
SHAPE OF PROPERLY MADE BRUSH

Drawings Show Points to Look [illegible]

How the Brushes Should Be Wrapped for Storage

[illegible] average householder. In addition, the matter of keeping brushes in good condition throughout the year remains a knows that this shouldn't be done, and everyone has experienced the consequences at one time or another.

The most important part entering into the

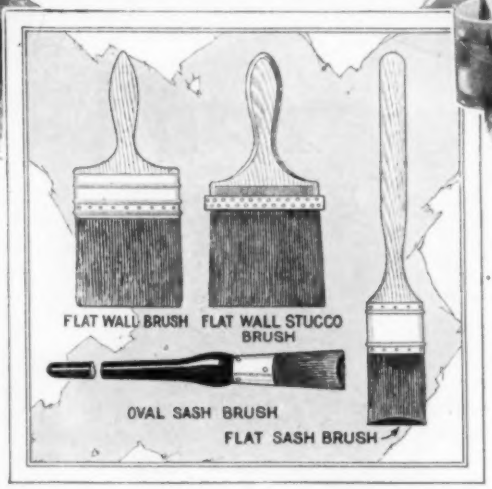
construction of a brush is hog bristle. There is no other material that is as good as this for paintbrushes. Hog bristle is horny and elastic and has excellent wearing qualities, and besides this, the peculiar formation of the ends of the bristles renders them particularly good for the purpose. An examination of the bristle under the microscope shows that it has a hard, horny outer shell, composed of minute scales, and a softer pith in the center; it is a little larger in diameter at the root than at the tip, and at the "business" end it branches out into several smaller ends, called the "flag" end, as shown in one of the illustrations. This end really forms a small brush in itself, and is what enables a brush to carry a load of paint well. This characteristic is also largely due to the fact that hog bristles are barbed for their entire length.

The most common substitute for bristle in inferior brushes is horsehair. This has not the flag end found in the bristle, and besides, has not the elasticity and is not barbed like bristle, and consequently it will not carry the same amount of paint.

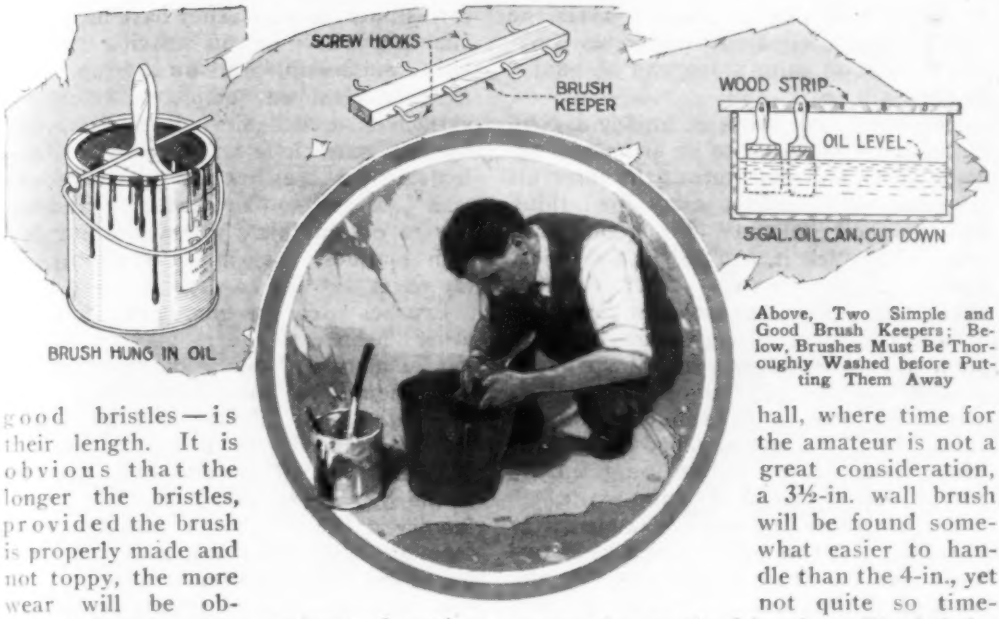
A properly made brush is built up of bristles of several lengths. If the bristles were all of one length, the brush would have a decided flare at the ends. It is a common error of the amateur to buy a brush because it seems "full," when, as a matter of fact, it may contain too much horsehair, and merely be "toppy." When the flag ends of the bristles have worn down, a brush of this type will spatter paint and "leak," as the painter calls it. A brush with graduated lengths of bristles, on the other hand, will wear for a long time, without any tendency to these faults. As the flag ends of the longest bristles wear out, those of the next length come into use; and as these wear, the next length, and so on, the brush retaining its good painting qualities until it is worn practically down to the ferrule.

The most important things to observe when buying a brush are the following: The bristles should be long, clean, straight and springy. The brush should feel well-balanced in the hand, and should present a trim, well-made appearance. Even with a certain amount of familiarity with the requirements of a good brush, it is rather difficult for the amateur to be sure that he is getting the best value for his money. The best advice one can give, aside from the foregoing, is to pay a good price for the tool, select only those made by a well-known manufacturer and to avoid cheap brushes, made by an unknown maker as one would the plague. With brushes, as with the tools of all other skilled trades, it is poor economy to buy cheap articles which, in the end, prove dear at any price. The main factor in the life of a brush—given

For Painting Walls, Use a Wide Brush and Save Time



For Window Trim, Use a Flat or Oval Sash Brush



Above, Two Simple and Good Brush Keepers; Below, Brushes Must Be Thoroughly Washed before Putting Them Away

good bristles—is their length. It is obvious that the longer the bristles, provided the brush is properly made and not toppy, the more wear will be obtained from it. The manner of setting the bristles is a matter of judgment on the part of the maker, and the buyer need have no prejudice in behalf of any particular method. Brushes with bristles set in glue, cement or rubber are all perfectly satisfactory, if made by a good maker, while brushes that appear to be set in the same manner, but selling at a low price and not backed by the name of a reliable manufacturer, may be useless, due to the shedding of the hairs.

As to the type of brush that is best for various painting jobs around the house, there are almost as many opinions as there are painters. Some prefer the flat, metal-bound type; others, again, will have nothing but the leather-bound flat stucco brush. Many painters prefer the older type of round and oval brushes for large surfaces. All are good, and the choice depends to some extent on what part of the country the reader is located in. There is one thing that should be taken into consideration, however, and that is the size of the brush. Where large surfaces are to be painted, a 4-in. brush will do the job in a quicker and more satisfactory manner than a 3-in. one, and if a new brush is to be purchased, the larger size should be bought for a job of this kind. For the average small-wall job, such as a bathroom or hall, where time for the amateur is not a great consideration, a 3½-in. wall brush will be found somewhat easier to handle than the 4-in., yet not quite so time-consuming as the 3-in. size. The bristles should be from 3 to 4 in. long. For painting small work, such as trim and window sash, etc., either a flat or an oval sash brush should be purchased. Flat brushes commonly used are the 1, 1½ and 2-in. sizes, and the bristles should be from 2 to 2½ in. long. The oval brushes are made from ⅞ to 1⅝ in. wide and with bristles ranging from about 1¾ to 2¾ in. in length. There is not much choice between the two types. The flat tools will cover the surface quicker than the oval, but the latter, on the other hand, are preferred by many painters for fine work.

The flat varnish brush is the tool for the amateur. This brush is very similar to the flat sash brush, but has a shorter handle, and is made in much greater variety. It is made from 1 to 4 in. wide, and with bristles from 1¾ to 4 in. long. For varnishing floors or other large surfaces, the 3-in. size will be found the most suitable, and the 1 to 1½-in. size for trim and small work. The best grades are made of white French bristles or Chinese black bristles of suitable length and good elasticity.

The varnish brushes used for flowing coats on fine furniture, for flowing on fine enamels, finishing automobiles, etc., form another class that will not be discussed here. Should the reader have oc-

casion to use one of these brushes, he will be well advised to present his problem to a good paint store, and be guided by their advice.

One would not think of buying a good chisel and allowing it to lie around to become rusty and dull during the intervals between use, and yet many men think they do their full duty by a good brush when they stick it, full of the paint just used, in a pail of water. A brush should never, under any circumstances, be stored in water. When a hog-bristle brush is plunged into water, it soaks it up like a sponge, and the next time the brush is dipped in paint or varnish the water is sealed in. The consequence is a soft, flabby brush, with twisted and unruly bristles, which cannot do good work.

Brushes should be cleaned immediately after use. If the job has not been finished, and the brush is to be used in the same paint next day or evening, put the brush in a pot of linseed oil overnight. Don't stand the brush in the pot. Hang it. Drill a hole through the handle to take a stiff wire that will extend from side to side of the pot, and so that the ends of the bristles will be at least ½ in. above the bottom of the pot. If several brushes are to be kept in the same pot, wire hooks can be made to hold them; but don't stand them. Brushes stood on end, no matter in what liquid, will bunch out and curl up at the ends, and then—good-by, good, easy work. Another good scheme is simply to use a piece of hardwood across the top of the pot. Into each edge of the wood strip drive a number of screw-hooks and hang the brushes on them. See that the oil in which the brushes are kept comes well up to but not over the ferrule. When the brushes cannot be stored in an oil bath, work as much paint as possible out of them on a clean board, then wipe them well with old rags, and finally wash out all the paint—every bit of it—in gasoline, benzine or kerosene. Straighten out the bristles and lay the brush on its side until it is dry.

Varnish brushes, or brushes used in enamel, may also be suspended in the oil pot overnight, but be sure to wipe the brush free from the oil before using it in the varnish again. It is really better to store varnish brushes overnight in the varnish can, in which they have been used, but this would mean leaving the can open, and a skin forms on the top, which must be removed completely before the varnish is used again. A special brush-keeping varnish is sold by paint stores for this purpose, but the amateur's varnish jobs are so few that it would not pay to obtain this. When cleaning varnish brushes, use only turpentine, and lay them out flat to dry.

Brushes used for aluminum, gold and other "bronze" lacquers may be washed out in alcohol, benzine or gasoline, and this should be done immediately after they are used. Shellac brushes should also be washed out in alcohol immediately after use. These are quite often kept in the shellac pot, and this is fairly satisfactory if the pot has a close-fitting lid through which the brush is tightly fitted, but if the top of the pot is open, the ferrule and the bristles around it become "seedy" from the shellac, which hardens between the bristles and afterward flakes off and gets all over the work.

If the brushes are not to be used for a long time, they should be thoroughly washed, with alcohol, turpentine, gasoline or benzine as the case may be, as previously directed, taking care that the bristles are thoroughly cleaned right up to the ferrules, then wrapped with paper, to keep dust and dirt out, and tied with string and laid away flat. Store them on a shelf in a cool room, and place a few mothballs around them. Moths will lay eggs in the bristles, hence the precaution.

All this may seem a lot of work, but it really takes much less time to do than to describe, and, as none but good brushes should be purchased, if the user wants to do decent work, and good brushes cost money, it is really worth while to care for them, not to mention the time saved when the next painting job comes along.

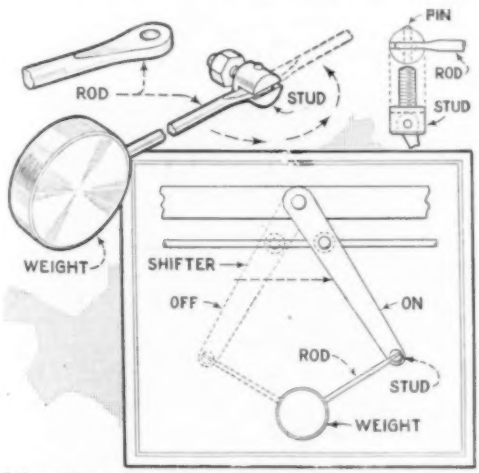
Soldering and Brazing Nichrome

While in the research department of a large concern manufacturing electric-heating appliances, I was called upon to devise a method of welding brass contacts to nichrome ribbon. Nichrome is a hard material to solder or braze, but this difficulty is overcome by fusing borax at

the point where the joint is to be made. The part is then cooled and the fused borax knocked off. This leaves a clean surface on the nichrome to which the solder or brazing compound will adhere. Nichrome wire or ribbon treated as above can be soldered nicely in this way.—Wm. Hoppie, Sunland, Calif.

Preventing Movement of Shifter Handle

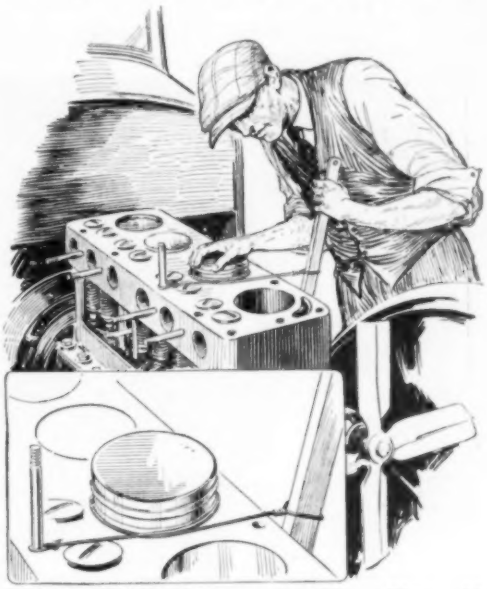
Some machines having a fast-and-loose pulley countershaft occasionally start up by themselves, which in many cases is dangerous. The trouble can be prevented in a simple manner on machines that do not need to be stopped or started often. Take a piece of round stock for a weight and drive a length of rod into it. Upset and flatten the other end of the rod and make a stud to fit on the end of the shifter handle. This is slotted and drilled to receive the flattened end of the rod, which is held by means of a pin, and is tightened with a nut. When the handle is moved to the on position, the weight is swung round to the center as shown, and this movement is reversed for the off position. Thus the handle is prevented from working in either direction. The device would be useless in the case of a machine that has to be stopped and started constantly, but many of the modern machines are controlled by a clutch below, the handle only being used to start the clutch pulley. It is to a machine of this type that this safety device applies.



Safety Device for Shifter Handle That Prevents Machine from Starting Too Easily

Piston-Ring Compressor

Where no special tools are available for the purpose, a piston-ring compressor made



Effective Method of Compressing Piston Rings with Length of Baling Wire

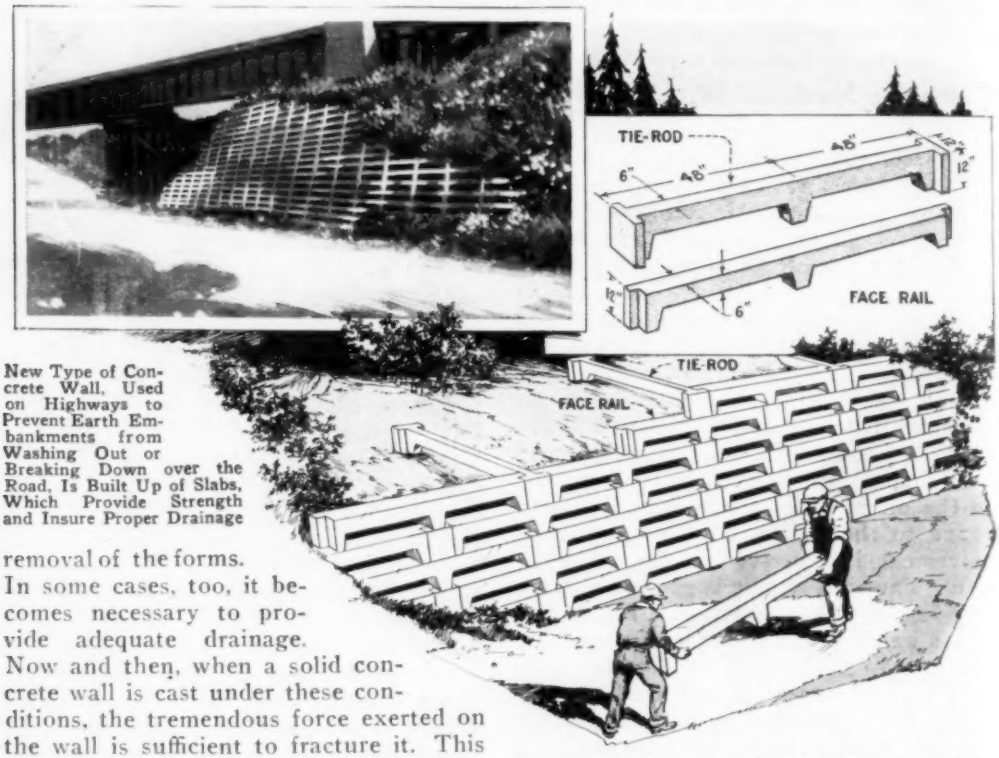
from a length of stovepipe or baling wire and a metal rod or hardwood stick will be found very effective. A loop is made at each end, one end is slipped over a stud driven into the block, the wire is wrapped around the piston ring and the other loop over the rod. Using the latter as a lever, the wire is pulled tight and the ring will be squeezed into place.—Luther Strosnider, Onaga, Kans.

How to Proofread Mimeograph Stencil

One of the stenographers in a New York office discovered a convenient method of proofreading mimeograph "dry" stencils. Instead of holding the stencil up to the light to read, or inking an impression, which makes it necessary to clean the stencil in case a correction has to be made, she places a thin sheet of paper between the fiber sheet and the backing. These new dry stencils have a coating of blue wax, which leaves the color on the sheet under pressure of the type. Thus the entire copy is printed in blue wax on the sheet inserted between the fiber and the backing.

Precast Units for Retaining Wall Provide Strength and Drainage

Much of the cost involved in erecting concrete retaining walls for embankments along highways is in the installation and removal of the forms. In some cases, too, it becomes necessary to provide adequate drainage. Now and then, when a solid concrete wall is cast under these conditions, the tremendous force exerted on the wall is sufficient to fracture it. This involves more expense and sometimes necessitates renewal. One steep embankment on a main highway leading out of Omaha, Nebr., is faced with a novel and wholly satisfactory concrete wall built up of units, as shown in the drawing. The face rails are 8 ft. long, with interlocking joints at the ends, and of the section shown. They are held in place by means of tie-rod slabs, which have a special head to interlock with the face slabs. As a rule, the tie-rod slabs are about 8 ft. long to insure proper anchorage for the whole wall and about 12 in. square at the ends, while the body is about 6 in. square, but may vary in length. One distinct advantage of this type of wall is that the slabs can be precast where raw materials are convenient and during spare time. There is plenty of flexibility to suit any road condition, and as the face of the wall is open, all surplus moisture drains off without damage. No mortar is used in making these walls. The concrete used is a 1-to-5 mixture of cement and gravel. Steel reinforcing rods, four in number, are laid in each unit, the ends being bent at right angles to add greater strength.—Dale R. Van Horn, Walton, Nebr.



New Type of Concrete Wall, Used on Highways to Prevent Earth Embankments from Washing Out or Breaking Down over the Road, Is Built Up of Slabs, Which Provide Strength and Insure Proper Drainage

Interior Painting

Interior painting is rather expensive and there are many who do their best to cut expenses when building a home. To these it will be of interest to know that Georgia pine, which is much used for interior trim, can be well covered with only two coats of paint before applying the necessary finishing coats of enamel. In other words, two coats of paint are eliminated and much labor saved, as it usually takes from three to four undercoats, properly sanded, to do the work in the ordinary way. In the simpler method, a mixture of seven parts pure linseed oil and one part pure pine tar is used for the

priming coat. This must be rubbed in well with a brush. When dry, apply a coat of pure white lead, thinned with raw linseed oil, with very little drier, and to this add just enough good lampblack to give it a slightly gray tint. Brush out this second coat well so that all chances of blistering will be eliminated. The trim is then ready for the enamel coating, and the grain will not show.—L. H. Georger, Buffalo, N. Y.

Testing Length of Rubber Bumpers

Rubber bumpers on the door frame of closed cars sometimes require adjustment because they do not touch the door when closed. This is due either to wear on the blocks, or warping of the door or frame. As several rubber blocks are used on each door it is difficult to see which are touching the door when closed. A strip of tough paper held at one end from the inside of the door and projecting outward over a rubber block and between the door and the frame will show if it is touching the door when closed. If the paper can be removed easily after the door is closed the rubber block is too short.

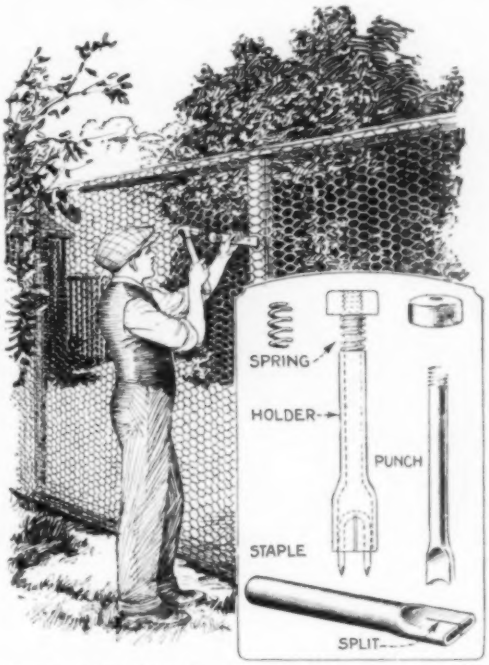
Non-Skid Loading Plate

Sheet-iron plates used for loading from platforms to freight cars, or vice versa, often become slippery, and are a fruitful source of accidents. A good method of improving the plate is to weld onto its surface a number of short "ribs," as shown in the photo. They are built up by using welding rods and an acetylene torch.

Ribs Welded on Surface of Loading Plate Prevent Trucks from Skidding on It

Staple-Driving Tool

Driving staples is usually a rather awkward task, but with the holder shown in

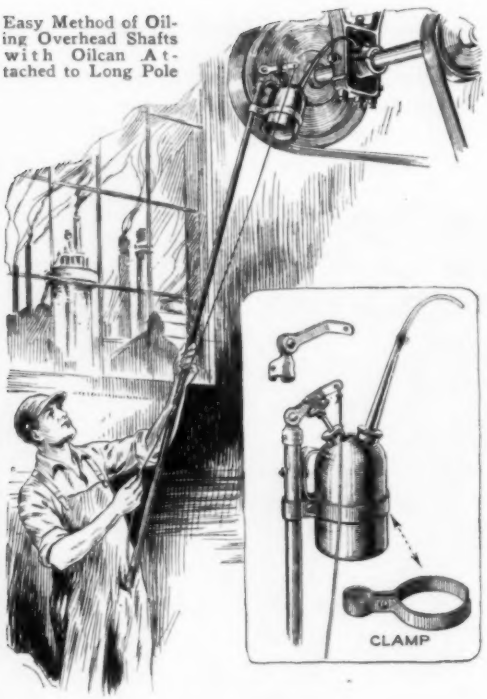


Staple Driver Made from Bolt and Piece of Metal Tubing Saves Time and Sore Fingers

the illustration it becomes easy, saving time and sore fingers. It consists of a piece of metal tubing, flattened at one end to receive the staple, and a punch made from a bolt, which can be slid up and down in the tube. The head of the bolt is cut off and the end flattened and ground to fit inside the lower end of the tubing, while the threaded portion projects beyond the upper end to receive a small coil spring and a nut. The use of the tool is obvious.

Casting Oil Grooves in Bearings

When pouring bearings, for example the main bearings in a cylinder block, a perfect oil groove can be made by laying in short pieces of match stems of the desired length before the babbitt is poured. A piece of metal is sometimes used for this, but it is difficult to remove, while the wood burns away almost entirely, leaving a good groove.—R. M. Shelton, Dallas, Tex.



Easy Method of Oiling Overhead Shafts with Oilcan Attached to Long Pole

Oiling Overhead Shafts

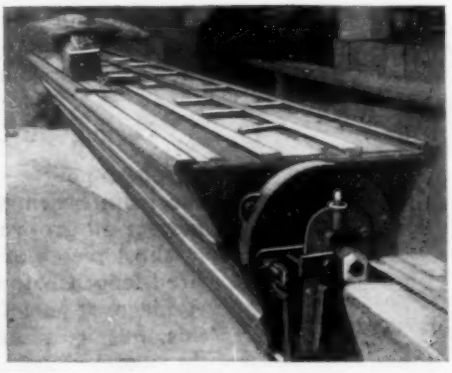
We found it annoying, while oiling overhead shafts, to carry a ladder, especially when there was quite a bit of machinery around. One mechanic solved the problem by attaching a pump oilcan to the end of a 10-ft. pole. A bent spout, as shown in the drawing, permitted the worker to drop the oil from above the shaft. The oilcan was attached to the pole by means of two pieces of strap iron, bent to fit around the oilcan and the pole and with a ½-in. flat portion between, which was drilled for a screw. A short lever was made of a strip of 1/16-in. stock and pivoted to the upper end of the pole, as indicated. A hole is drilled in one end of the lever to permit the attachment of a cord, which is pulled down to actuate the pump plunger on the oilcan. When in use, the pole is held in one hand and the lower end steadied against the body, while the cord is pulled with the other hand to discharge the oil.—L. J. Flugel, Chicago, Ill.

Holder for Bendix-Cover Screws

The Ford bendix cover must sometimes be replaced when no special tool is at hand for holding the four small screws. The gasket should be prepared by shellacking one side and dusting the other side with graphite or tire mica. It is stuck in place on the transmission cover with the graphite side out. If the cover must be removed later, the gasket will remain on the transmission cover and be uninjured. The screws on the side next to motor are started and the cover replaced, the slotted screw holes in the cover allowing the edge to be moved under the heads of the screws. The upper and lower screws are easily placed and a holder made of small wire is used to start the screw next to the frame of the car. The holder is made by wrapping one end of a piece of fine wire around the body of the screw. When starting the screw, it is lowered from above with one hand and held at the right place while the screwdriver is used with the other hand. When the screw is well started, the wire is pulled off.—E. T. Gunderson, Jr., Humboldt, Iowa.

Triangular Gluing Table Triples Output

A manufacturer of pianos has solved the problem of increasing the production on one operation, in the same amount of space by providing a three-sided gluing table of the type shown in the photo. It consists of a triangular framework upon which the sides are fastened and is supported on a shaft in the center so that a workman can turn and then lock it with any one of its three sides at the top.



Triangular Gluing Table Rotates on a Horizontal Shaft and Triples Output

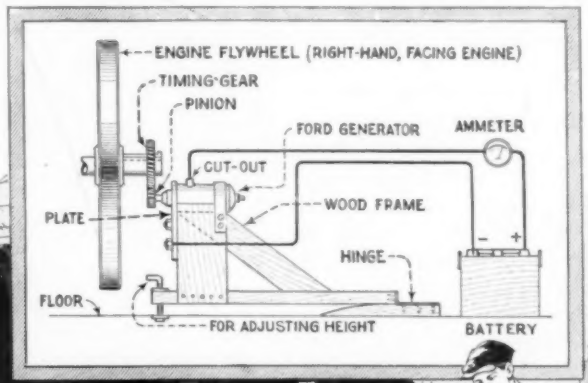
Battery Charging with the Farm Engine

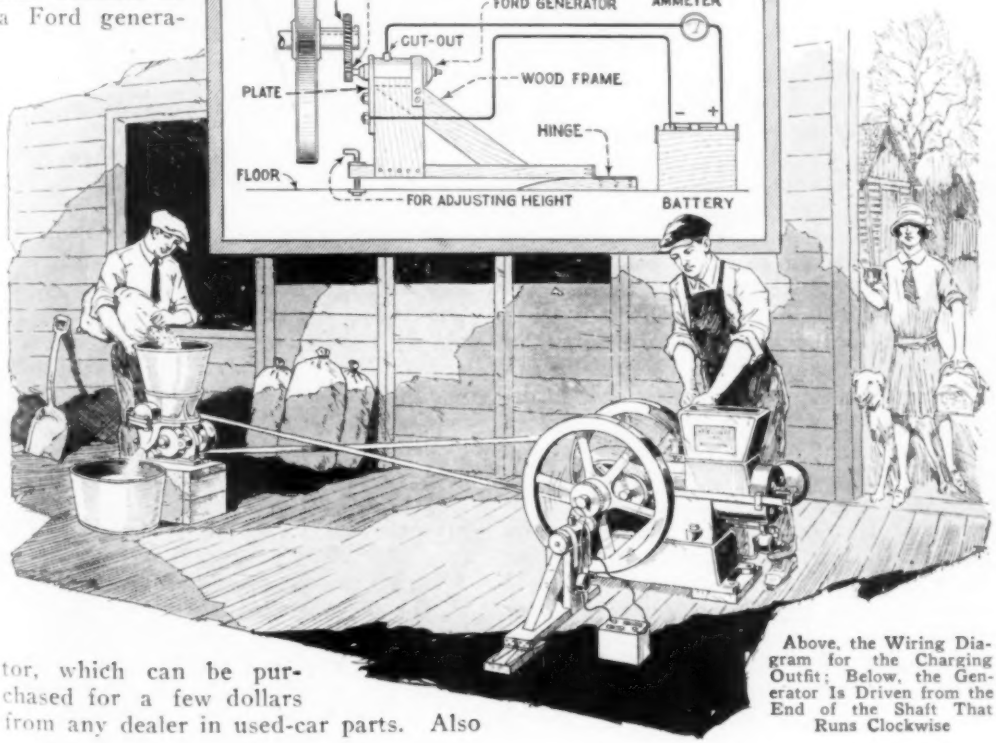
By L. B. ROBBINS

NOT all farms are provided with current from the public mains or from their own lighting plant. It is therefore necessary for the owners to take car, truck and radio batteries to town to some charging station when they become low or discharged. Practically every farm of any size, however, does possess a gasoline engine for pumping, ensilage cutting and general work, and where such an engine is of 3 hp. or more, and fastened to a solid foundation, it can easily be used for battery charging without altering it in the least. Engines vary so much in design, size and minor details that specific directions cannot be given to suit all types, but the general idea in this article can be worked out by anyone to suit his own engine. Just carry out the principles of the design, and you will have no trouble in the construction of this simple equipment.

The charging unit consists of a Ford generator, which can be purchased for a few dollars from any dealer in used-car parts. Also buy a large Ford timing gear, and be sure the pinion on the generator shaft is included. First fit the timing gear to the crankshaft of the engine. This should be on the wheel turning clockwise, and is usually on the right-hand side of the engine, although this depends on the type. It may be necessary to bore out the shaft hole in the gear and enlarge the keyway to fit the shaft. If so, be sure to center it perfectly, then drive it on so it fits near the end of the shaft, as indicated in the drawing.

A wooden frame should then be assembled after the design shown. This consists of two upright pieces of 2 by 6-in. stuff, which are mortised and bolted to a horizontal base of the same material. Set the uprights back a few inches from one end, and bolt a slanting brace between them of any suitable heavy wood. The rear end





Above, the Wiring Diagram for the Charging Outfit; Below, the Generator Is Driven from the End of the Shaft That Runs Clockwise

of this should be beveled for bolting to the base at the other end. The tops of the brace and the uprights are then cut out to fit the curve of the generator.

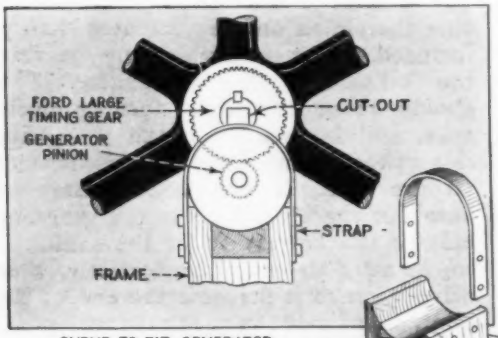


Fig. 2

Next make a generator plate of sheet steel, as shown in the detail. The pinion end of the generator should project through the hole, and be bolted to the plate exactly as in the casting in the car. The bottom end of the plate is bolted to the vertical sides of the uprights and brace, as shown, so that the body of the generator rests in the curved timbers provided for it. With the generator in place on the plate, it should be further secured by a metal strap, fitting about it and bolted to the sides of the uprights.

Arrange a block on the floor so that, when the rear end of the frame is hinged to it, the base will be exactly level, the generator pinion engaged with the timing gear on the engine and directly underneath it. An arrangement must then be made so the height can be raised or lowered to provide the right backlash between the gears. This is shown in detail, and consists of a steel plate bolted to the top of the base and a second plate bolted to the floor. A round steel rod, threaded nearly its entire length, is screwed through a hole tapped in the upper plate. It turns freely in a larger hole in the floor plate, where it is held from moving lengthways by a shoulder and flange, or by a pair of small collars, above and below this plate. The rod is bent at right angles at the top for a handle. Then a guide iron should be bolted to the floor to prevent the base from moving sidewise. This is simply a piece of flat steel bolted to the floor, each end being bent up at right angles to just clear the edges of the base.

Connect one wire to the generator plate and to the negative pole of the battery. The positive wire should then be connected to the cut-out terminal and to the positive battery terminal, with an ammeter inserted as shown, to indicate the rate of charging, although this can be dispensed with if desired.

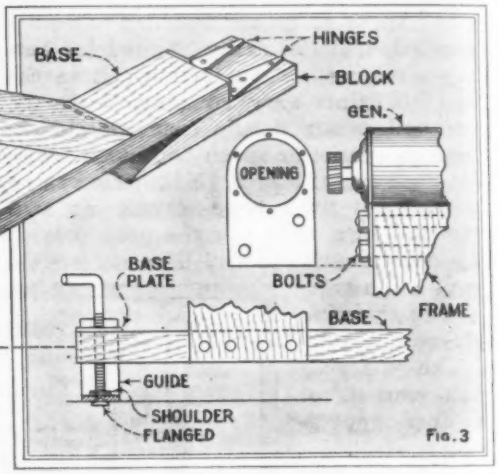


Fig. 3

Details of Generator Mounting and Fitting for Disengaging Drive When Generator Is Not Wanted

The height adjuster serves to lower the pinion from the gear when the generator is not to be used. This is necessary when no charging is to be done, because running the generator without a battery in the line will soon burn out the windings. So, when through charging, simply turn the handle of the adjuster rod to lower the free end of the base, which disengages the pinion and allows the engine to run free. Then, when a battery is to be charged, simply reverse the process until the pinion and gear reengage properly. Keep the gears well greased and oil the pinion end of the generator shaft and the cup at the other.

Such a charging outfit will serve to keep all the 6 to 8-volt storage batteries "up to scratch" and, by using a high charging rate, this can be done in a few hours, while the power pulley at the opposite end of the shaft is doing other work.

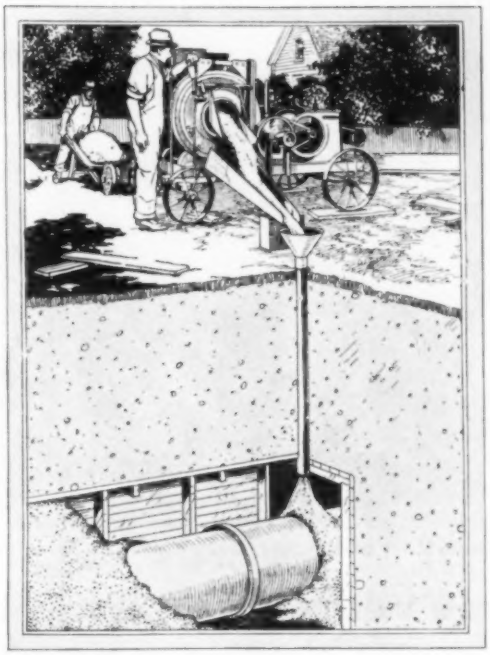
Temporary Repair for Broken Shaft Made with Tubing

When a line shaft breaks, or any shaft that is well exposed, a temporary repair can be made with a short piece of heavy pipe. Choose as long a piece of pipe as is practical to use and with an inside diameter as near to that of the shafting as possible. Drill two or three holes through the pipe on each side of the center. These holes should be staggered. Tap them for heavy setscrews, slip the pipe over the broken ends of the shafting and take up on the screws until the shafting is held securely. If the pipe is slightly larger than the shafting, make a shim to take up the slack all around before assembling.—L. B. Robbins, Harwich, Mass.

Traffic Signal for Motor Trucks with Inclosed Cabs

For trucks having closed cabs, a traffic signal of the kind shown will be found useful. It consists of a wooden arm, pivoted at one end on the front of the cab and fitted at the other with a stuffed, white glove. A strong cord is run through a hole in the front of the cab above the signal arm, and a knob tied to the end. When a left turn is about to be made, the cord is pulled and the white glove will rise into plain sight to the left of the cab, as indicated in the illustration.—E. T. Gunderson, Jr., Humboldt, Iowa.

Traffic Signal on a Large Truck Is Useful When Making Left Turns



Filling Water-Conduit Tunnel from Above with Lean Concrete through a Six-Inch Spout

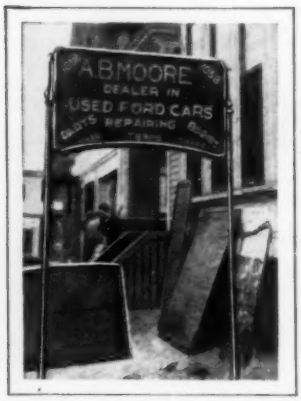
Safe Method of Backfilling Tunnel

The drawing shows a safe method of backfilling a water-conduit tunnel, used by a western contractor. Rather than backfill with earth, which would necessitate the dangerous work of pulling out timbers, he leaves the latter in place and fills the tunnels with lean concrete. The concrete is mixed on the ground and is poured into the tunnel, a vertical distance of 10 to 30 ft., through 6-in. well casings which are sunk at 25-ft. intervals. It is then shoveled into place.

Cement Hog Wallow Uses Old Oil

A Nebraska farmer had some material left over after building a concrete foundation and utilized this in making a hog wallow. A wide, shallow trench was dug and the concrete was spread over the surface about 2 in. thick. Old crankcase oil from cars and tractors, is poured into it. The hogs like it, and it has proved more effective than many types of oilers and disinfectants he used previously. During hot weather the wallow is filled with water and a little oil floats on top. During winter oil only is used.

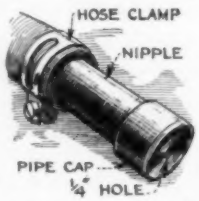
Windshield Frame Makes Sign Mount



A discarded auto-windshield frame makes a good mounting for a sign, as shown in the illustration. While the glass itself can be used to paint the sign on, thin wood may be substituted. The two standards which support the sign are lengths of ordinary pipe. Besides being novel, the sign is very cheap. —L. I. Thomas, Oak Park, Ill.

Hose Nozzle Made from Pipe Fittings

In many industrial plants, mills and factories, it is customary to provide hose connections for conveniently washing floors, vats, etc. A cheap and easily made nozzle is shown in the drawing. It is simply a short nipple of the proper size inserted in the end of the hose and held in place by a hose clamp. On the other end of the nipple is screwed a common pipe cap, in the center of which has been drilled a hole, ¼ to ⅜ in. in diameter, depending upon the size of the hose. This nozzle delivers a strong, solid stream, which is most effective for washing purposes.—Leslie G. Roller, Cedar Rapids, Iowa.



Keeping Your Brakes in Order

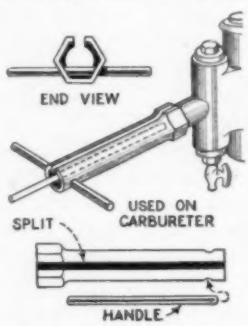
One seldom feels the need of brakes until that nerve-racking moment when even four of them do not seem enough, and because such moments are becoming more common as traffic congestion is getting worse, it is a good plan to look over the brakes each week. This is a job that the auto owner should do himself, for there is probably no one who knows the state of efficiency of the brakes better than he, and no one will give them closer attention. A mechanic may reline and adjust them properly, but the everyday care is usually left to the owner. Before attempting any adjustment of a brake, one should study its action from the lever back to the drums. If the mechanism is carefully examined, a great many unoiled joints will be found that may cause trouble. The rusty clevis pins should be oiled and all threaded portions of adjusting rods should be protected from rust by an application of oil or grease. Trouble in adjusting them is thus prevented. Occasionally one of the brake cams will freeze and, when this happens, an easy way of freeing it is to apply a mixture of lubricating oil and kerosene and operate the brake until the cam loosens up. The oil will eventually work its way to the corroded point and end the trouble. Avoid spilling an excessive amount of the mixture on the brake lining, as this will prevent the brake from working. This mixture can be used to advantage in lubricating all the brake mechanism.

Gauge for Setting Calipers in Wood Turning

In turning a number of wooden articles, each having several different diameters, it is very troublesome to use a rule to set the calipers for each diameter. To overcome this difficulty, a wooden gauge, turned down to different diameters, will be found handy. If the gauge is marked to correspond to the diameters, there will be no confusion in setting the calipers.

Wrench for Union Nuts on Small Pipe

An open-end wrench frequently is used for tightening nuts on the joints or unions, of small pipes, on autos, trucks, tractors and gas engines, for the fuel or oiling systems. An improvement over the open-end wrench, which will not always fit these unions, is a socket wrench



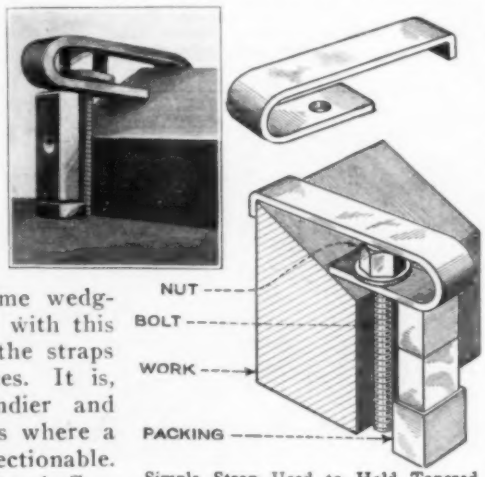
of the type shown in the drawing. A slit is cut in the side, just wide enough to pass over the pipe in the fuel or oil system. A pin will serve as a turning lever or tommy. The tool can be made of steel pipe, by forging one end to grip the nut, if a standard size is not available.

Hotbed Is Built over Brooder House

Last spring I built an extension to the south side of our brooder house and arranged it so as to have a hotbed directly above. The extension was built 2 ft. wide and as long as the brooder house, which was 8 ft. This addition was covered with boards, resting on 2 by 4-in. joists, and the hotbed was built over this. The warmth from the room gave the plants an early start and prevented their freezing, although several times the temperature was as low as 20 degrees.—Geo. G. McVicker, North Bend, Nebr.

Strap for Clamping Tapered Work

Tapered work is very difficult to hold down on a machine table, and as an ordinary flat strap, bearing on the edge, does not clamp it securely, it is customary to wedge the work between supports at the back and straps bearing on the tapering part. This method requires a great deal of time, however, and therefore one shop has devised the special strap shown in the illustration. The same wedging effect is obtained with this single strap as with the straps and supporting pieces. It is, moreover, much handier and preferable in all cases where a top strap is not objectionable. —Harry Moore, Montreal, Can.



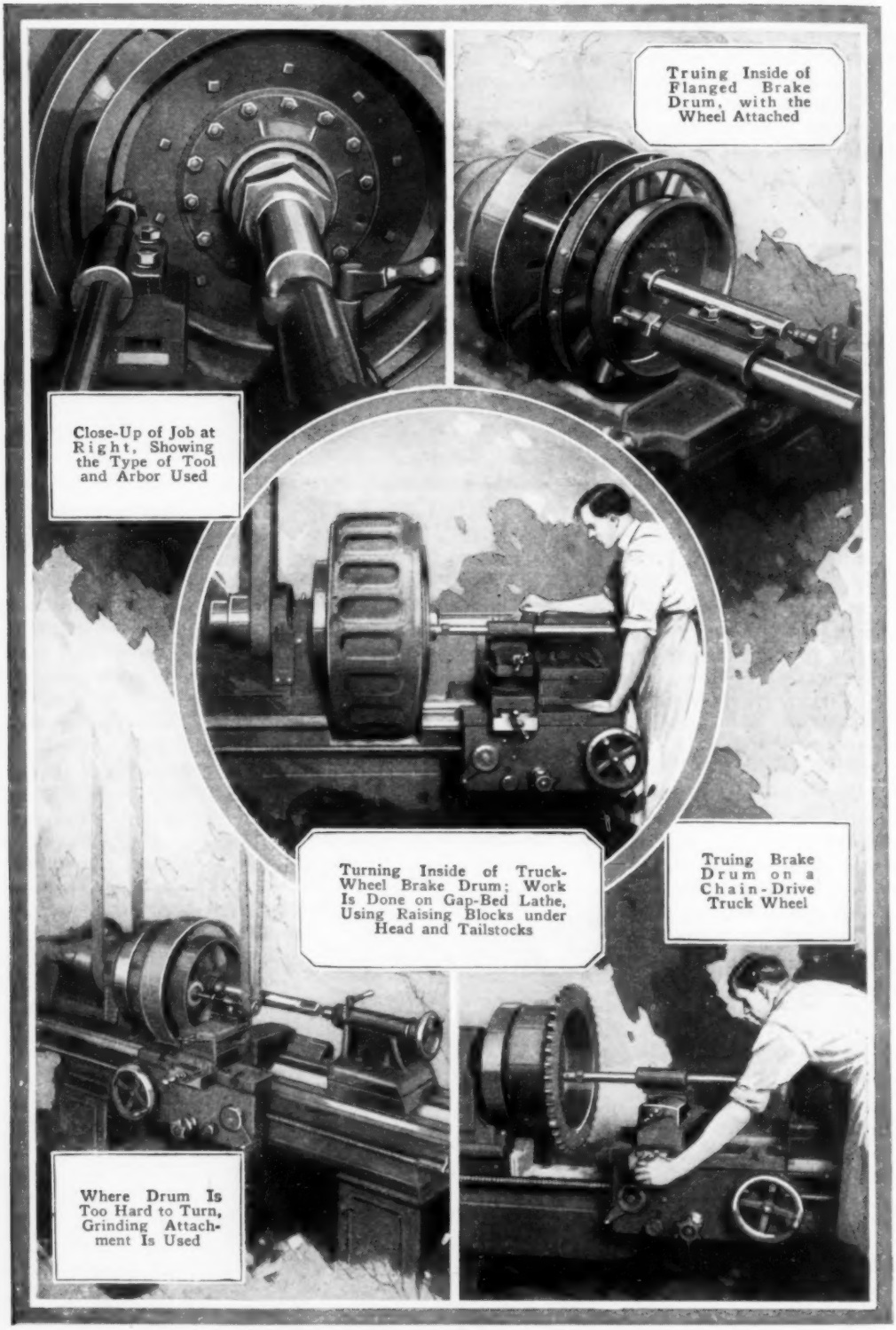
Simple Strap Used to Hold Tapered Work on Machine Table

Tires Protect Pavement from Mower

When traversing paved streets in town or the highways in the country with farm implements having wheels provided with cleats or studs, such as mowers, considerable injury often results to the street surface, especially if it is soft, as asphalt. It is often necessary to load these implements on trucks or wagons to transport them in order to prevent such damage. A better and simpler remedy for the trouble is to slip some old tire casings over the wheels, as shown in the photo. If the wheels are too large for a single tire, two casings are cut and slipped on, the section not covered by one tire being covered by a section of another. It will, of course, be necessary to wire short sections of tire to the wheel. The natural shape of the single tire will keep it on the wheel securely. — Herbert C. McKay, Eustis, Florida.

Old Tires Slipped over Wheels of Farm Implements Protect Soft Pavements and Road Surfaces from Injury

¶Sometimes it is desired to decorate the walls of a house where the plaster is cracked; most owners use wallpaper, but better results will be obtained, if building paper is applied first or, better still, canvas.


Truing Inside of Flanged Brake Drum, with the Wheel Attached
Close-Up of Job at Right, Showing the Type of Tool and Arbor Used
Turning Inside of Truck-Wheel Brake Drum; Work Is Done on Gap-Bed Lathe, Using Raising Blocks under Head and Tailstocks
Truing Brake Drum on a Chain-Drive Truck Wheel
Where Drum Is Too Hard to Turn, Grinding Attachment Is Used

Photos Courtesy So. Bend Lathe Works

Keeping Truck Brakes Efficient

Lack of trueness in brake drums may result from various causes, such as accidents, wedging of small objects between the drum and the bands, and so on. In any case, to provide proper braking action, the drums must run true and be perfectly round. One untrue drum may cause brake grabbing, skidding and other troubles.

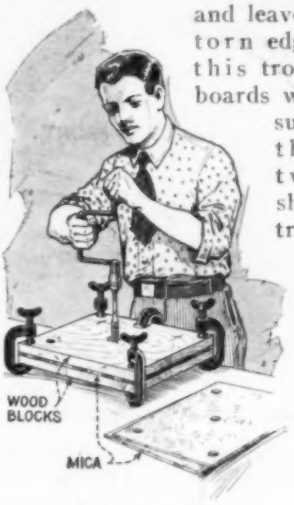
To true a brake drum properly, it should be turned or ground while attached to the wheel on which it is used. This is not always possible, but the drum should never be removed from the wheel if it can be avoided, as rebolting it is almost sure to spring it out of round or warp it in some way. Not only should the drum be left attached to the wheel, but the wheel should be mounted on an arbor and swung on lathe centers while the truing operation is done. The ideal type of lathe for this work is a gap-bed lathe, which has part of the bed next to the headstock removable, so that work of a much larger diameter than the lathe will normally take can be placed in it. Additional swing may be obtained by using specially made blocks for raising the head and tailstocks of the lathe a few inches.

In some cases, bus or passenger-car wheels may be mounted in the lathe on their own axles, but usually it is better to employ a special mandrel.

Where an occasional drum is found too hard to turn, it is trued by the use of a grinding attachment, substituted for the toolpost of the lathe.—Avery E. Granville, Cleveland, Ohio.

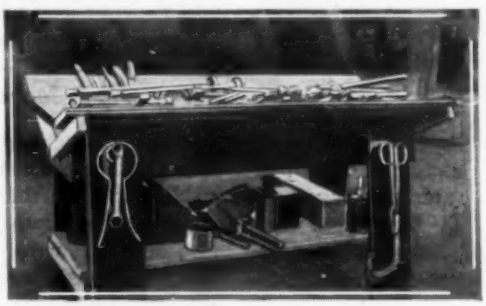
Drilling Mica

When cutting or drilling holes in mica or bakelite, the tool often breaks through and leaves a ragged and torn edge. To prevent this trouble, take two boards with smooth, flat surfaces and clamp the material between them, as shown in the illustration, using C-clamps to hold the three together. The pieces of wood should be cut the same size as the bakelite or mica and all the edges should be in alinement, so that the template can be used on the wood. In the case of bakelite, it is only necessary to clamp a piece of wood below the work, as the drill only leaves a ragged edge on the underside.



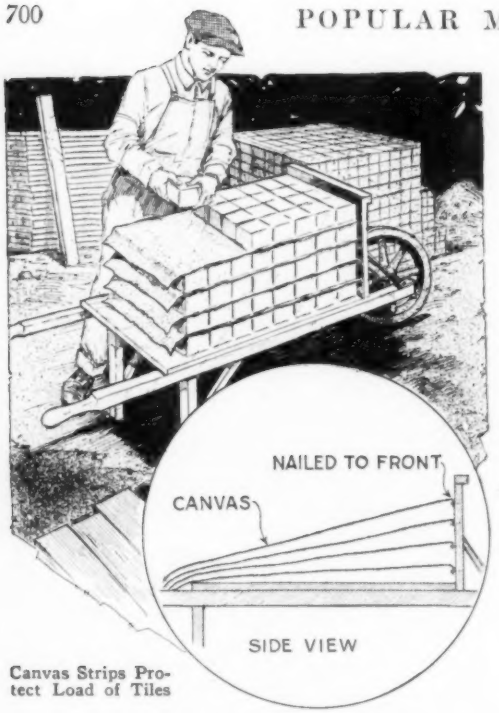
Portable Workbench for the Garage

Most auto mechanics like to have a full assortment of tools at hand where they can be reached without going from the workbench to the toolroom or to a wall rack. A sturdy bench, which is portable and can be pulled up beside the car on which the work is done, is a great convenience. The photo shows a workbench and tool tray of this type. The bench is made of 2-in. material and has a lower shelf for holding cans of shellac, oil and some of the heavier tools. The top has two sloping sides, which make a tray for containing the tools, so that they will not roll off when the bench is moved from place to place. The legs of the bench are mounted on casters to facilitate shifting to any part of the shop. At night, it can be pushed into the tool room and locked up without removing the tools. If desired, a heavy vise can be mounted at one end.



Handy, Portable Workbench for the Auto Mechanic Holds Full Assortment of Tools

Hard-rubber balls and old golf balls make good stoppers for washbowls or laundry tubs.

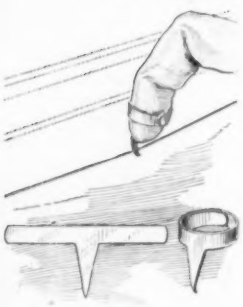


Canvas Strips Protect Load of Tiles

Carrying Tiles on Wheelbarrow

When moving tiles, brick and other similar material on a wheelbarrow the edges are likely to be chipped or otherwise damaged, and for this reason straw is often used between the layers. Straw, however, is not always available, so one builder uses pieces of canvas, one end of which is tacked to the vertical rest of the barrow, as shown in the detail. The pieces are laid between the layers of tile and prevent breakage and chipping.

Pick for Snapping Chalkline



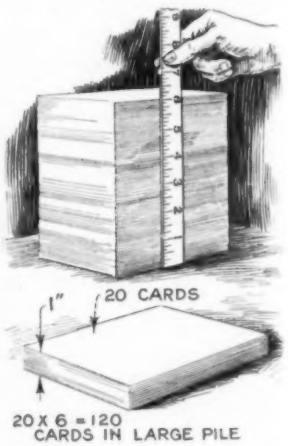
Sign painters, sidewalk artists and others who employ a chalkline in laying out their work usually find it difficult to stretch the line with both hands and at the same time snap it. To overcome this difficulty, a Wisconsin sign artist uses the simple little pick shown in the illustration. A piece of fairly heavy tin is cut to the shape shown and the ends are bent to form a ring that will fit snugly over the tip of the index finger. When stretching the line, it is held in the usual way except that the thumb and second finger of the right hand grasp one end leaving the forefinger free to use the pick.—G. E. Hendrickson, Argyle, Wis.

Fillng Holes in Castings

The following formula is for use when holes in iron castings must be filled for appearance' sake, and where strength is not a factor: Sulphur, 50 parts; fine iron filings, 20 parts; graphite, 20 parts; all by weight and powdered. The powder, when mixed, is placed in the holes and melted with a hot iron.—Maynard Bodley, St. Paul, Minn.

How to Count Cards Quickly

When it is necessary to find the number of cards or sheets of paper in a pile, which would probably take a few hours to count in the customary way, a quick, rough estimate can be made by counting a small stack, about ¼ or ½ in. high, and then measuring the whole pile. In this manner you will find how many small stacks are equivalent to the large one, and a simple multiplication gives you the number of cards or sheets in the latter.—Julius Duncan, New Orleans, La.



Countershaft Mounted on Auto Springs

A clever method of mounting a small countershaft was shown to me by a local machinist when he pointed out a support consisting of two cast-off auto springs. The springs were bolted to the timbers overhead and the bearings were fitted with bushings to accommodate the countershaft. Then they were slightly spread

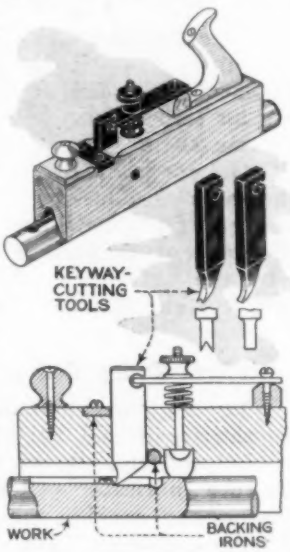
and the belting arranged to the machines. As the belting stretched, the tension of the springs automatically took up the slack.—L. B. Robbins, Harwich, Mass.

Starting Joints in Old Piping

Old steam or water pipes that are being taken down often offer difficulty at the joints where turned into fittings. Too much twist will either split the pipe or spoil the fitting. A better way, when other methods fail, is to apply quick and intense heat to the fitting to expand it suddenly. This can be done by pouring a ladleful of hot lead over the fitting in a small, rapid stream, allowing it to collect in a suitable dish below so that it can be returned to the pot before it hardens. The sudden application of heat will expand the fitting and the threads can usually be started immediately after the pouring has been done.

Keyway-Cutting Plane

For cutting keyways on small shafts, the tool shown here will be found quite a timesaver compared with a file and chisel. It is made of a piece of hardwood for the body, about 1½ or 1¾ in. thick, 2¼ in. high and 12 in. long. The keyway-cutting tools are 5/16 by ¼ in. or larger. One is used to start the cut and the other to finish it. Backing irons are set into the plane body to support the bits, and a piece of iron, ⅛ by ¾ by 3 in. long and made as shown, is used with the thumbnut to feed the bit into the work. A very light cut should be made at each stroke of the plane.—Geo. H. Cappel, Wilmer, Ala.



Safe Knife-Switch Thrower

Open knife switches in factories can be mounted near the ceiling and controlled with a length of sash cord, as shown in the drawing. The switch is mounted on a board which is held vertically by means of braces attached to the joists. A length of rope is tied to the handle of the switch and is passed over two small pulleys attached to the joists on either side of the switch. A knot is tied in the rope a few inches below the pulleys, to prevent pulling one end out of reach.

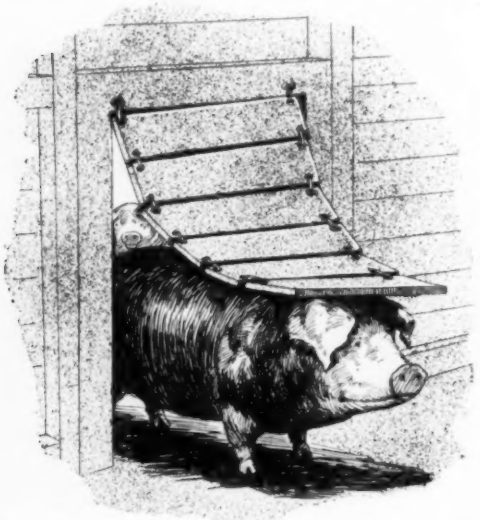
Repair for Loose Tail-Lamp Socket

The socket in Ford tail lamps, up to 1925, is soldered to the body of the lamps and projects below it for the plug. The soldered joint is necessary to ground the current and, if it is broken, the light flickers and goes out. Tools for soldering are not often at hand when this occurs, but an emergency repair can be made by wrapping a small wire around the socket below the body of the lamp. The other end of the wire is pulled tight and tied to the frame of the car. This will keep a steady sidewise pull on the socket and hold it in contact with the body of the lamp, thus grounding the current and keeping the lamp lighted until the connection can be soldered.

¶It is difficult to remove insulation from the heavy wire used in outdoor wiring with a knife, but if the ends of the wires can be placed upon a stone or some other hard surface, a few hammer blows will flatten and break the toughest insulation so that it can be peeled with the fingers.

Door Keeps Chickens Out of Hog House

A sectional, hanging door for the hog house, as shown in the drawing, will keep

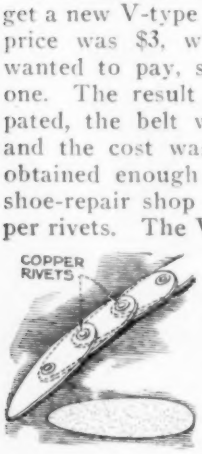


Keeping Chickens Out of Hog House with Sectional Hanging Door

chickens out and does not hinder the hogs. Cut a 6-in. board in lengths equal to the width of the door. Two holes are drilled in the ends of each board so that they can be wired together and the assembly hung in the doorway as shown.—Elmer Raihala, Floodwood, Minn.

Making a V-Type Fan Belt

It became necessary some time ago to get a new V-type fan belt for my car. The price was $3, which was more than I wanted to pay, so I proceeded to make one. The result was better than anticipated, the belt was entirely satisfactory and the cost was less than 50 cents. I obtained enough scrap sole leather at a shoe-repair shop to make it, and 50 copper rivets. The V-shaped pieces were cut



out as indicated in the drawing, all pieces being made as nearly alike as possible and then riveted together. After riveting, the belt was placed in a vise and the sides planed down to make a smooth surface. The flat side of the belt was also dressed down a little, care being taken in doing this not to strike the rivet heads.—A. S. Jamieson, Springfield, Mass.

Magnet Tool Replaces Spring in Valve Grinding

If the valve-grinding tool used when overhauling an automobile engine is magnetized, the usual spring under the valve head may be dispensed with, since the valve will be lifted with the tool. Most garages have a coil for remagnetizing magneto magnets, and the end of the grinding tool can be magnetized in this.

How to Drive Small Screws in Deep Slots

In the absence of a magnetized screwdriver or the commercial article fitted with a spring clasp for holding the screw, one is "up against it" when driving a small screw in an awkward place, such as a deep slot. Here is a very simple way to do the job, however. Take a narrow strip of cloth twice the length of the screwdriver. Cut a slit in its center lengthwise like a buttonhole, a little longer than the diameter of the screw head. Slip the screw through this slit and hold it in place on the end of the screwdriver by means of the cloth strip, as shown in the illustration. The screw may then easily be slipped in place and the cloth pulled off after the screw has taken hold.—Harry D. Tiemann, Madison, Wis.

To Free Spring Bolt of Hard Grease

When the grease hole in a bolt is drilled lengthwise, the old, hardened grease may be loosened and started out so that the pressure lubricator will do its work by this method, making the removal of the bolt unnecessary. Take off the pressure-lubricator fitting and get a short piece of rod, stiff wire or even a nail squared off at the end, that will just slide in the

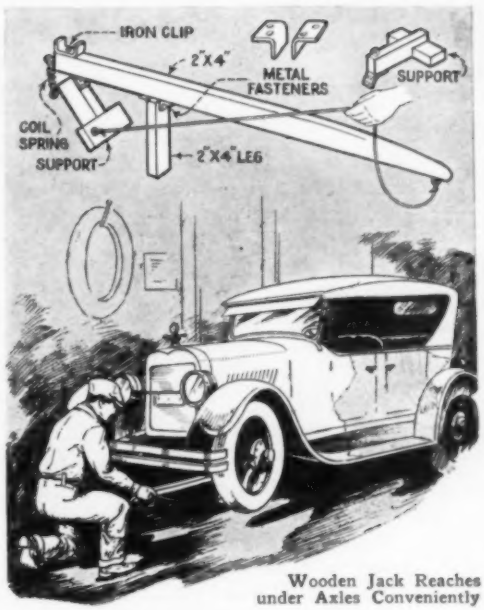
grease hole. Start it into the hole a short distance and give it a sharp blow with a hammer. The resulting pressure inside of the bolt will be so great that, in almost every case, when the fitting is replaced and pressure applied as usual with the lubricator, the grease will enter and spread readily.—Sherwood J. Gee, Salt Lake City, Utah.

Lead Content of Tin Easily Determined

It is sometimes necessary to determine the lead content of tin. This can be done as follows: Make a solution of potassium chromate in water. Apply a few drops of acetic acid to the tin which is to be examined, and a white coating will appear. Apply a few drops of the potassium-chromate solution to the white coating and, if the spot turns yellow, the tin contains lead, and the more yellow it appears the more lead it contains.—L. H. Georger, Buffalo, N. Y.

Trick for Cleaning Drain Pipe

It is quite difficult to clean out a side pipe of a drain with a hose, as the end of the hose will not enter the branch. This difficulty can be overcome by removing the nozzle and doubling one end of the hose, as indicated in the drawing, using a lath to push it back to the side pipe, upon reaching which the folded end will snap into it. In ordinary cases of cleaning the long horizontal drain pipes, the nozzle is left on the hose, which is pushed up and pulled back several times, with the water turned on, until the obstruction is removed.—M. W. Lowry, Athens, Ga.



Wooden Jack Reaches under Axles Conveniently

Quick-Acting Auto Jack

When changing tires on a car with bumpers, it is unhandy to use a short-handled jack. Several makes of jacks, with long handles and low-lift positions, are obtainable on the market but a good, wooden jack, which is just as effective, can be made as shown in the drawing, and will prove very serviceable, especially for garage use. A length of 2 by 4-in. wood is fitted at one end with a U-shaped bracket or clip, made from a piece of flat iron. About 1 ft. from the end, a short section of 2 by 4-in. stock is securely fastened by means of heavy angle brackets. On the end, a T-shaped support is hinged and a small coil spring is attached to keep it pulled forward. A cord is fastened to the bottom of the T-support to pull it back. The handle end is planed round for convenience in handling. To use the jack, keep the T-support back by means of the cord, slip the U-clip under the axle, then bear down on the handle. As soon as the axle has been raised sufficiently, release the cord, and let the axle down on the support.

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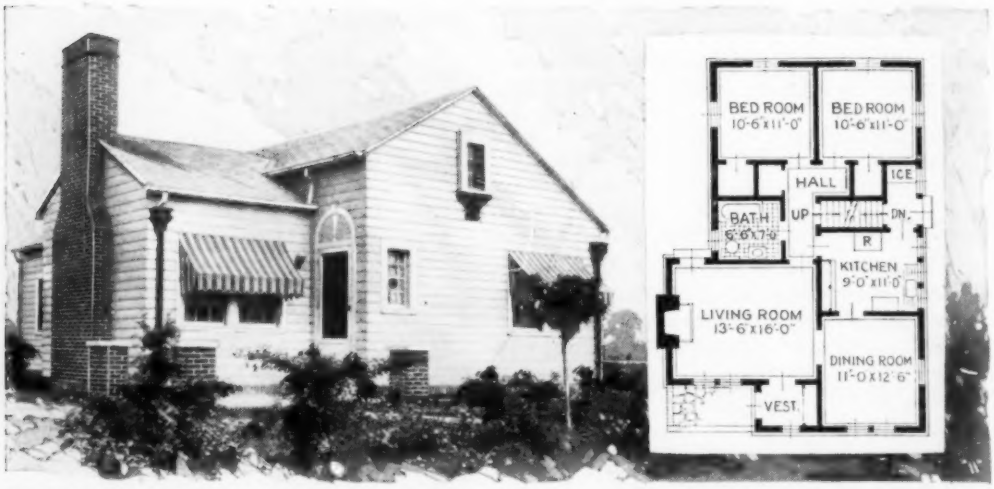
Is This Your Home?



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Plan No. 5D32

QUESTIONS regarding home building addressed to this magazine will be answered by The Architects' Small House Service Bureau of the United States, Inc., controlled by the American Institute of Architects and endorsed by the United States department of commerce. Inclose 10c and self-addressed envelope. Blueprints, specifications and material list for the house shown here may be obtained at nominal cost. Inclose self-addressed stamped envelope for reply. If further information is desired, send 5c and stamped envelope for a 24-page booklet explaining how the Small House Service Bureau functions and showing 12 sample plans. A new booklet, entitled "Fifty Ways to Lower Home Building Costs," illustrated by ten bureau houses actually lived in, and showing how as much as $1,000 can be saved on a home, may be obtained for 20 cents.

THE house illustrated here is a typical American bungalow of five rooms. One of the major problems of any one-story dwelling of more than four rooms is to obtain proper ventilation. Inevitably, since there are only four corners, some of the rooms cannot be lighted on more than one side unless there are expensive offsets in the plan. This difficulty has been overcome by equipping the kitchen with a complete wall of windows. In addition, it opens upon the rear entry way in such a manner as to provide two more wide openings for proper ventilation.

There are two bedrooms, each with a large closet. From the rear hallway rises the stairway to the attic and access is had through this hall to the bath and kitchen. The living room, dining room and kitchen are arranged much as they would be in a two-story house.

The living room is provided with a doorway at the side of the fireplace for entry into the garden. The fireplace itself dominates the living room. It may be flanked on either side by windows, if desired. It is located in such a position that people sitting about it are not disturbed by those passing from the vestibule to the dining room.

The exterior of the house is characterized by the charm and simplicity of the homes of our forefathers built during the Colonial period. The combination of plan and exterior is simple, honest and straightforward, characteristic of the best spirit of our American civilization.

A home builder anxious to secure a distinctive appearance without having to go to extra expense will find in this design just what he wants. Beauty is gained through the skillful spacing of the different parts that make up the walls rather than through the addition of decorative features, such as columns, benches, blinds and hooded canopies.

The construction is of wood with exterior finish of wide shingles. The chimney is common brick, plastered or painted. The roof is shingled. A lot of at least forty-foot frontage is required.